

*DOE/ID-10587  
Revision 8  
March 2004*



U.S. Department of Energy  
Idaho Operations Office

# ***Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning***



# **Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning**

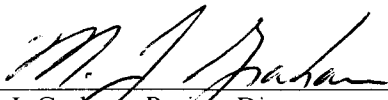
**March 2004**

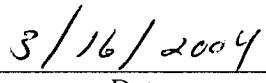
**Prepared for the  
U.S. Department of Energy  
Idaho Operations Office**

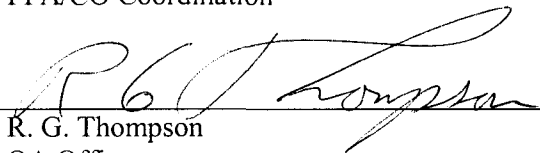
# Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning

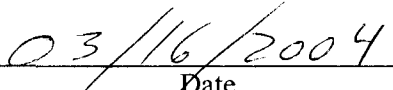
DOE/ID-10587  
Revision 8

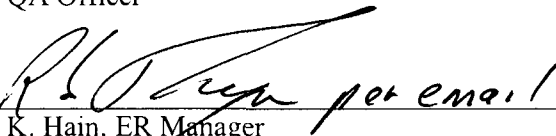
Approved by

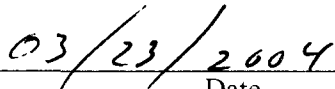
  
\_\_\_\_\_  
M. J. Graham, Project Director  
Balance of INEEL Cleanup  
FFA/CO Coordination

  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
R. G. Thompson  
QA Officer

  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
K. Hain, ER Manager  
U.S. Department of Energy  
Idaho Operations Office

  
\_\_\_\_\_  
Date

## **ABSTRACT**

This Quality Assurance Project Plan was prepared for use by the Idaho Completion Project Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning at the Idaho National Engineering and Environmental Laboratory. This Quality Assurance Project Plan discusses the quality assurance and quality control requirements for numerous projects at the Idaho National Engineering and Environmental Laboratory. The standard analytical laboratory methods used for analysis are referenced in this plan. In addition, the various sample holding times, sample sizes, and preservation requirements are provided.



# CONTENTS

ABSTRACT.....	iii
ACRONYMS.....	ix
DISTRIBUTION LIST .....	xiii
1. PROJECT MANAGEMENT .....	1-1
1.1 Project Organization .....	1-1
1.1.1 Participants.....	1-1
1.1.2 Roles and Responsibilities .....	1-3
1.2 Problem Definition/Background.....	1-3
1.2.1 Overview of the Idaho National Engineering and Environmental Laboratory .....	1-4
1.2.2 Overview of the Various Waste Area Groups.....	1-4
1.2.3 Overview of Deactivation, Decontamination, and Decommissioning .....	1-13
1.2.4 Site-Specific Information.....	1-13
1.3 Project Plans .....	1-13
1.3.1 Remedial Investigation/Feasibility Studies and Deactivation, Decontamination, and Decommissioning Plans.....	1-13
1.3.2 Schedule.....	1-14
1.4 Guidance for the Data Quality Objective Process .....	1-14
1.4.1 Project Quality Objectives .....	1-15
1.4.2 Analytical Data Categories .....	1-15
1.4.3 Screening Data with Definitive Confirmation .....	1-16
1.4.4 Definitive Data.....	1-17
1.4.5 Impact of Data Categories on Existing Superfund Guidance .....	1-18
1.4.6 Measurement Performance Criteria .....	1-28
1.5 Special Training Requirements/Certifications.....	1-37
1.5.1 Training.....	1-37
1.5.2 Certification .....	1-38
1.6 Documentation and Records.....	1-38
1.6.1 Field Operation Records .....	1-38
1.6.2 Data Handling Records .....	1-40
1.6.3 Laboratory Records.....	1-40
1.6.4 Document Control.....	1-41
1.6.5 Data Reporting Package Archival and Retrieval.....	1-41

2.	DATA ACQUISITION .....	2-1
2.1	Sampling Process Design .....	2-1
2.1.1	Field Investigations .....	2-1
2.1.2	Sample Site Selection.....	2-1
2.1.3	Sample Site Description.....	2-2
2.2	Sampling Methods Requirements .....	2-2
2.3	Sample Handling and Custody Requirements .....	2-9
2.3.1	Sample Handling.....	2-9
2.3.2	Sample Shipping .....	2-9
2.3.3	Sample Custody .....	2-11
2.4	Analytical Method Requirements .....	2-11
2.4.1	Subsampling.....	2-12
2.4.2	Preparation of Samples .....	2-12
2.4.3	Analytical Methods .....	2-12
2.5	Quality Control Requirements .....	2-16
2.5.1	Field Quality Control Requirements .....	2-16
2.5.2	Laboratory Quality Control Requirements.....	2-16
2.6	Instrument Testing, Inspection, and Maintenance Requirements.....	2-16
2.7	Instrument Calibration.....	2-17
2.8	Inspection/Acceptance Requirements for Supplies and Consumables .....	2-17
2.9	Data Acquisition Requirements (Nondirect Measurements) .....	2-18
2.10	Data Management.....	2-18
2.10.1	Data Recording .....	2-18
2.10.2	Data Validation .....	2-18
2.10.3	Data Transformation .....	2-19
2.10.4	Data Reduction.....	2-19
2.10.5	Data Analysis .....	2-20
2.10.6	Data Tracking.....	2-20
2.10.7	Data Storage and Retrieval.....	2-20
3.	ASSESSMENT/OVERSIGHT .....	3-1
3.1	Assessments and Response Actions .....	3-1
3.1.1	Field Surveillance .....	3-1
3.1.2	Contractor-Expanded Review .....	3-1
3.1.3	Readiness Reviews.....	3-1

3.1.4	Technical Systems Audits .....	3-1
3.1.5	Performance Evaluation .....	3-2
3.1.6	Audit of Data Quality .....	3-2
3.1.7	Data Quality Assessment .....	3-2
3.1.8	Documentation of Assessments .....	3-2
3.2	Report to Management .....	3-2
4.	DATA VALIDATION AND USABILITY .....	4-1
4.1	Data Review, Validation, and Verification Requirements.....	4-1
4.2	Validation and Verification Methods .....	4-2
4.3	Reconciliation with Data Quality Objectives .....	4-2
4.3.1	Corrective Action .....	4-2
4.3.2	Calculation of Data Quality Indicators .....	4-2
5.	REFERENCES .....	5-1
	Appendix A—Additional Field Sampling Plan Requirements .....	A-1
	Appendix B—Examples of Forms Used.....	B-1

## FIGURES

1-1.	Basic organization and communication chart of Federal Facility Agreement and Consent Order participants .....	1-2
1-2.	Map of the Idaho National Engineering and Environmental Laboratory .....	1-5

## TABLES

1-1.	References for problem description/background for each waste area group.....	1-11
1-2.	Contract Laboratory Program volatile-organic target compound list.....	1-20
1-3.	Contract Laboratory Program semivolatile organic target-compound list .....	1-22
1-4.	Contract Laboratory Program pesticide organic-target-compound list .....	1-25
1-5.	Recommended minimum field quality control samples. <sup>a, b, c, d, e</sup> .....	1-26
1-6.	Required detection limits for inorganic analyses (metals, wet chemical, and miscellaneous methods).....	1-30
1-7.	Radionuclide analysis list for the Idaho Completion Project. <sup>a</sup> .....	1-31



1-8.	U.S. Environmental Protection Agency Drinking Water Method 524.2 target analyte list.....	1-33
1-9.	Toxicity characteristic leaching procedure volatile organic target compound list .....	1-36
1-10.	Toxicity characteristic leaching procedure semivolatile organic target compound list.....	1-36
1-11.	Toxicity characteristic leaching procedure pesticides/herbicides target compound list.....	1-37
2-1.	Summary of sample collection, holding time, and preservation requirements.....	2-3
2-2.	Summary of sample collection, holding time, and preservation requirements for radiological water analyses.....	2-7
2-3.	Physical property measurement methods .....	2-13

## ACRONYMS

%R	percent recovery
AEF	Argonne Experimental Facility
AMDV	analytical method data validation
ARA	Auxiliary Reactor Area
ASTM	American Society for Testing and Materials
BBWI	Bechtel BWXT Idaho, LLC
BMC	blanket master contract
BORAX	Boiling Water Reactor Experiment
CAS	Chemical Abstract Service
CER	contractor-expanded review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CRDL	contract-required detection limit
CRQL	contract-required quantification limit
CTF	Contained Test Facility
D&D	decontamination and decommissioning
D&D&D	deactivation, decontamination, and decommissioning
DA	determinative analysis
DOE	U.S. Department of Energy
DQA	data quality assessment
DQO	data quality objective
EBR	Experimental Breeder Reactor
EDMS	Electronic Document Management System
EPA	U.S. Environmental Protection Agency

EQL	estimated quantitation limit
FDC	field data coordinator
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
FSP	field sampling plan
FTL	field team leader
GDE	guide
HASP	health and safety plan
HAZWOPER	hazardous waste operator (training)
HDPE	high-density polyethylene
ICP	Idaho Completion Project
ICPP	Idaho Chemical Processing Plant
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
L&V	limitations and validation
LCCDA	Liquid Corrosive Chemical Disposal Area
LCS	laboratory control sample
LST	list
MCL	maximum contaminant level
MCP	management control procedure
MDA	minimum detectable activity
MDL	method detection limit
MS	matrix spike
NCSL	National Conference of Standards Laboratories
ND	nondetect
NE-ID	U.S. Department of Energy Idaho Operations Office

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OIS	Optical Imaging System
OMRE	Organic-Moderated Reactor Experiment
ORD	ordnance
OU	operable unit
PAR	precision of the absolute range
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
PE	performance evaluation
PLN	plan
ppm	parts per million
PRG	preliminary remediation goal
QA	quality assurance
QA/QC	quality assurance/quality control
QAPjP	quality assurance project plan
QC	quality control
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RDL	required detection limit
RD/RA	remedial design/remedial action
RI	remedial investigation
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RPD	relative percent difference
RSD	relative standard deviation

RWMC	Radioactive Waste Management Complex
SADTS	Sample and Data Tracking System
SAM	Sample and Analysis Management
SAP	sampling and analysis plan
SDA	Subsurface Disposal Area
SDWA	Safe Drinking Water Act
SFE	stored fuel exterior
SOP	standard operating procedure
SOW	statement of work
SPERT	Special Power Excursion Reactor Test
SRPA	Snake River Plain Aquifer
STF	Security Training Facility
SVOC	semivolatile organic compound
TAL	target analyte list
TAN	Test Area North
TCLP	toxicity characteristic leaching procedure
TOS	task order statement of work
TPH	total petroleum hydrocarbon
TPR	technical procedure
TRA	Test Reactor Area
TRU	transuranic
TSF	Technical Support Facility
USC	United States Code
VOC	volatile organic compound
WAG	waste area group
WRRTF	Water Reactor Research Test Facility

## DISTRIBUTION LIST

Name	Title/Organization	Telephone Number
K. Hain	Director, Environmental Restoration Program/NE-ID	(208) 526-4392
N. Ceto	Program Manager Office of Environmental Cleanup/EPA, Region 10	(509) 376-9529
D. Koch	Acting Remediation Manager, Idaho Department of Environmental Quality	(208) 373-0492
M. Graham	Project Director, Balance of INEEL Cleanup, WAGs 2, 4, 5, 6, and 10/BBWI	(208) 526-2945
G. Nelson	WAGs 2, 6, and 10/NE-ID	(208) 526-0077
C. Hathaway	WAGs 4 and 5/NE-ID	(208) 526-4049
J. Schaffer	Project Director, Clean/Close RWMC, WAG 7/BBWI	(208) 526-3029
J. Snook	WAG 7/NE-ID	(208) 526-5920
R. Miklos	Project Director, Clean/Close TAN, WAG 1/BBWI	(208) 526-4072
R. Shaw	WAG 1/NE-ID	(208) 526-6442
R. Loos	Project Director, Clean/Close INTEC, WAG 3/BBWI	(208) 526-4561
R. Collins-Hall	WAG 3/NE-ID	(208) 526-1661
J. Simonds	Project Manager, ICDF/BBWI	(208) 526-2770
K. O'Neill	ICDF/NE-ID	(208) 526-5455
D. Sanow	D&D/NE-ID	(208) 526-1049
W. Harker	Deactivation/NE-ID	(208) 526-3224
M. Hodel	Long-Term Stewardship/BBWI	(208) 526-9684
P. Natoni	Manager, Long-Term Stewardship/NE-ID	(208) 526-0977
A. Sumariwalla	Manager, Sample and Analysis Management/BBWI	(208) 526-3141
R. Thompson	Quality Engineer/QA Officer/BBWI	(208) 526-9618
J. Farren	Quality Engineer/BBWI	(208) 526-1084

The Idaho National Engineering and Environmental Laboratory (INEEL) contractor controls this Quality Assurance Project Plan (QAPjP) for the U.S. Department of Energy (DOE). Each revision to this QAPjP will receive a complete review and approval by the U.S. Department of Energy Idaho Operations Office (NE-ID), Idaho Department of Environmental Quality (IDEQ), and U.S. Environmental Protection Agency (EPA), Region X.



# Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning

## 1. PROJECT MANAGEMENT

This Quality Assurance Project Plan (QAPjP) is for use by the Idaho Completion Project (ICP) Waste Area Groups (WAGs) 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning (D&D&D) at the Idaho National Engineering and Environmental Laboratory (INEEL). It presents the functional activities, organization, and quality assurance/quality control (QA/QC) protocols to achieve the data quality objectives (DQOs) dictated by the end use of the data. This QAPjP pertains to all environmental, geotechnical, geophysical, and radiological sampling, testing, measurement, and data review activities for WAGs 1, 2, 3, 4, 5, 6, 7, 10, and D&D&D. In addition, the standard and routine analytical methods used for analyzing samples are presented. This QAPjP meets the requirements of the following U.S. Environmental Protection Agency (EPA) documents: *EPA Requirements for Quality Management Plans* (EPA 2001) and *EPA Guidance for Quality Assurance Project Plans* (EPA 1998a). This QAPjP is used in conjunction with a site-specific field sampling plan (FSP) or other test plan. A list of items that must be included in an FSP using this QAPjP is included in Appendix A. Together this QAPjP and the FSP or test plan form a functional sampling and analysis plan (SAP).

### 1.1 Project Organization

This section provides the reader—U.S. Department of Energy (DOE), EPA, Idaho Department of Environmental Quality (IDEQ), INEEL contractor, and others—with a general understanding of the program organization, the role of various parties involved in the investigations, and the lines of authority and reporting for the program and projects. Project-specific organization, roles, lines of authority, and reporting are included in the FSP or test plan and the project-specific health and safety plans (HASPs).

#### 1.1.1 Participants

Under the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991a), the principal participants are the State of Idaho, EPA Region 10, and U.S. Department of Energy Idaho Operations Office (NE-ID).<sup>a</sup> Appendix D of the *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991b) lists the following project managers from each agency:

- Mr. R. Stallman, U.S. Department of Energy, Idaho Field Office
- Mr. W. Pierre, Chief Federal Facility Section, U. S. Environmental Protection Agency
- Mr. D. Nygard, Program Manager, Idaho Department of Environmental Quality.

---

a. The abbreviation NE-ID signifies that the U.S. Department of Energy Idaho Operations Office (which was abbreviated DOE-ID before October 1, 2003) reports to the U.S. Department of Energy Office of Nuclear Energy, Science, and Technology.



Other participants include the ICP project manager, project directors, subproject managers; ICP contractor Environmental Safety, Health, and Quality Assurance compliance professionals; subcontractors hired by the ICP contractor to perform work at one or more of the operable units (OUs); and those individuals listed on the distribution list for this QAPjP. Figure 1-1 shows the general relationship among participants.

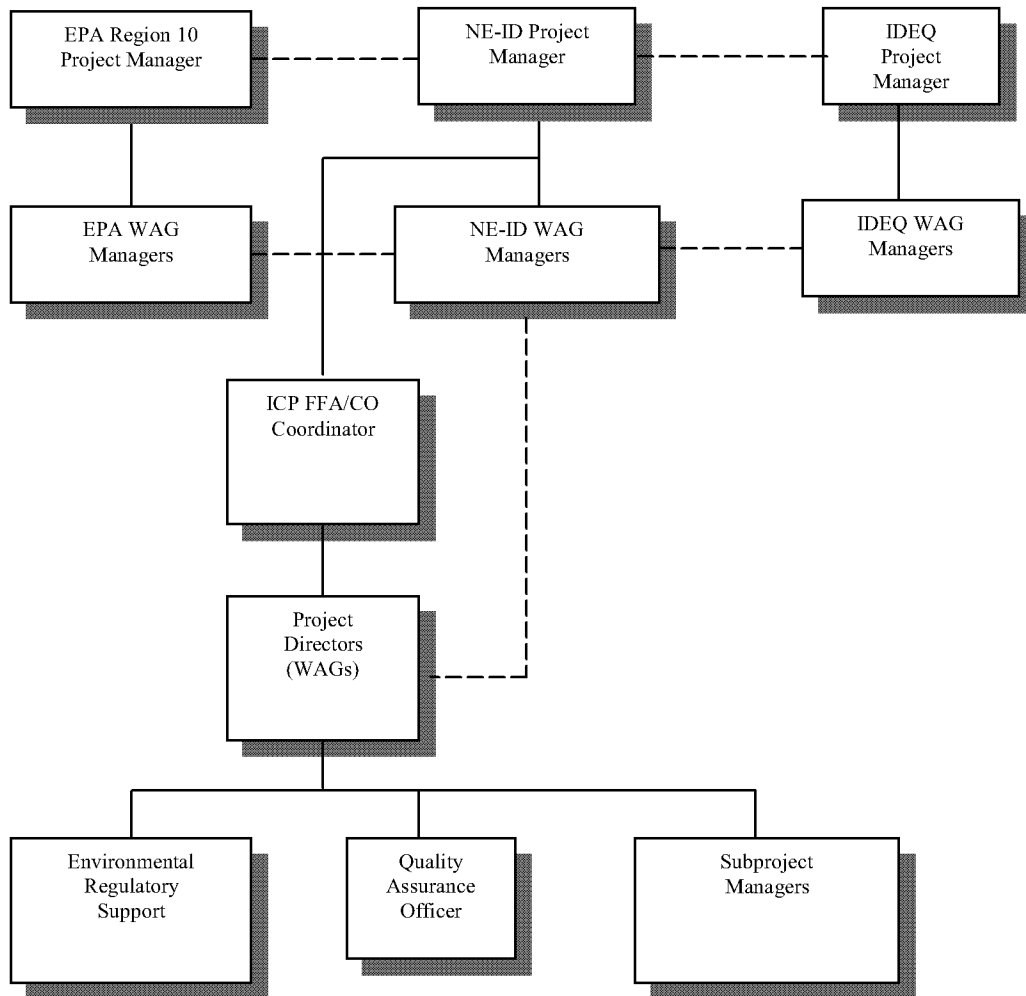


Figure 1-1. Basic organization and communication chart of Federal Facility Agreement and Consent Order participants.

### **1.1.2 Roles and Responsibilities**

As described in Section 4 of the *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991b), the NE-ID, IDEQ, and EPA Region 10 project managers have the following roles and responsibilities:

- Manage ICP remedial activities for their respective agencies pursuant to the Federal Facility Agreement and Consent Order (FFA/CO) and Action Plan
- Serve as primary contacts and coordinators for their respective agencies for purposes of implementing the FFA/CO and Action Plan
- Prioritize work
- Coordinate activities of WAG managers, as necessary
- Approve and sign “No Further Action Determinations”
- Evaluate and approve change to OUs based on investigation findings
- Prepare monthly progress reports.

The FFA/CO assigns the WAG managers the following roles and responsibilities:

- Manage remedial activities under the Action Plan at assigned WAG(s) under the direction of the project manager
- Serve as agency contact for the project manager for assigned WAG(s)
- Participate in project management meetings, as requested by project managers.

Professionals assigned to the projects provide support in the following areas: quality assurance, industrial safety, industrial health, radiological engineering, and radiological control technician. The specific roles, activities, and responsibilities of the aforementioned personnel and organizations and the internal lines of authority and communication within and between/among organizations are described in Plan (PLN) -694, “Project Execution Plan for the Balance of INEEL Cleanup Project”; facility- and process-specific documented safety analyses; auditable safety analyses; and project-specific HASPs.

The manager of ICP Program Coordination maintains a staff of environmental regulatory professionals to support all of the WAGs and D&D&D.

## **1.2 Problem Definition/Background**

The background information in this section provides a high-level discussion of the problems in historical perspective, giving QAPjP participants a basic understanding of the ICP scope. Project-specific FSPs, test plans, work plans, and other project-specific documents provide both the historical perspective for a particular site and the exact nature of the problems.

### 1.2.1 Overview of the Idaho National Engineering and Environmental Laboratory

The INEEL (see Figure 1-2) was proposed for listing on the National Priorities List (NPL) on July 14, 1989. The final rule that listed the INEEL on the NPL was published on November 21, 1989 (54 FR 48184). Before the NPL listing, environmental characterization work had been conducted under the *Consent Order and Compliance Agreement* (DOE-ID 1987) between the DOE and the EPA in accordance with the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.).

Following the NPL listing, the FFA/CO (DOE-ID 1991a) was negotiated among the DOE, EPA, and State of Idaho to implement characterization and remediation in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.). The Action Plan for implementing the FFA/CO has two “tracks” for an OU that requires field data collection: a Preliminary Scoping Track 1 and a Preliminary Scoping Track 2 investigation or a remedial investigation. In both cases, the goal is to determine if the risk(s) posed by the site are unacceptable as defined by 40 *Code of Federal Regulations* (CFR) 300, “National Oil and Hazardous Substances Pollution Contingency Plan,” and, if necessary, provide information for remedy selection and remedial design.

The remaining steps in the CERCLA process—as described in the FFA/CO (DOE-ID 1991a)—are interim action planning, remedial investigation/feasibility study (RI/FS) scoping process, RI/FS implementation, decision process, Record of Decision (ROD) schedule, post-ROD process, remedial design/remedial action (RD/RA) process, remedial design process, remedial action process, and operation and maintenance.

### 1.2.2 Overview of the Various Waste Area Groups

**1.2.2.1 Waste Area Group 1—Test Area North.** Test Area North (TAN) encompasses several areas: the Technical Support Facility (TSF); Initial Engine Test Facility; Contained Test Facility (CTF), previously known as the Loss-of-Fluid Test Facility; Specific Manufacturing Capability Facility; and Water Reactor Research Test Facility (WRRTF).

In general, TSF consists of facilities for handling, storage, examination, and research and development of spent nuclear fuel. The Process Experimental Pilot Plant, a facility originally built to determine the capabilities of processing transuranic waste destined for the Waste Isolation Pilot Plant, also is located here and is undergoing D&D&D.

The Initial Engine Test Facility is an abandoned facility north of TSF that has numerous historical sites and is undergoing D&D&D. The Initial Engine Test Facility was designed as a testing location for the nuclear jet engines developed under the Aircraft Nuclear Propulsion Program in the 1950s and early 1960s.

The CTF and the Specific Manufacturing Capability Facility are contiguous facilities west of TSF that consist of structures built for those two operations and an old building from the Aircraft Nuclear Propulsion Program. The CTF is an inactive facility that was originally constructed for nuclear reactor tests. The Specific Manufacturing Capability Facility is an active facility that manufactures components for a U.S. Department of Defense non-nuclear weapons system.

The WRRTF primarily consists of two buildings southeast of TSF that have housed several non-nuclear tests, mostly for simulating and testing water systems used in reactors.

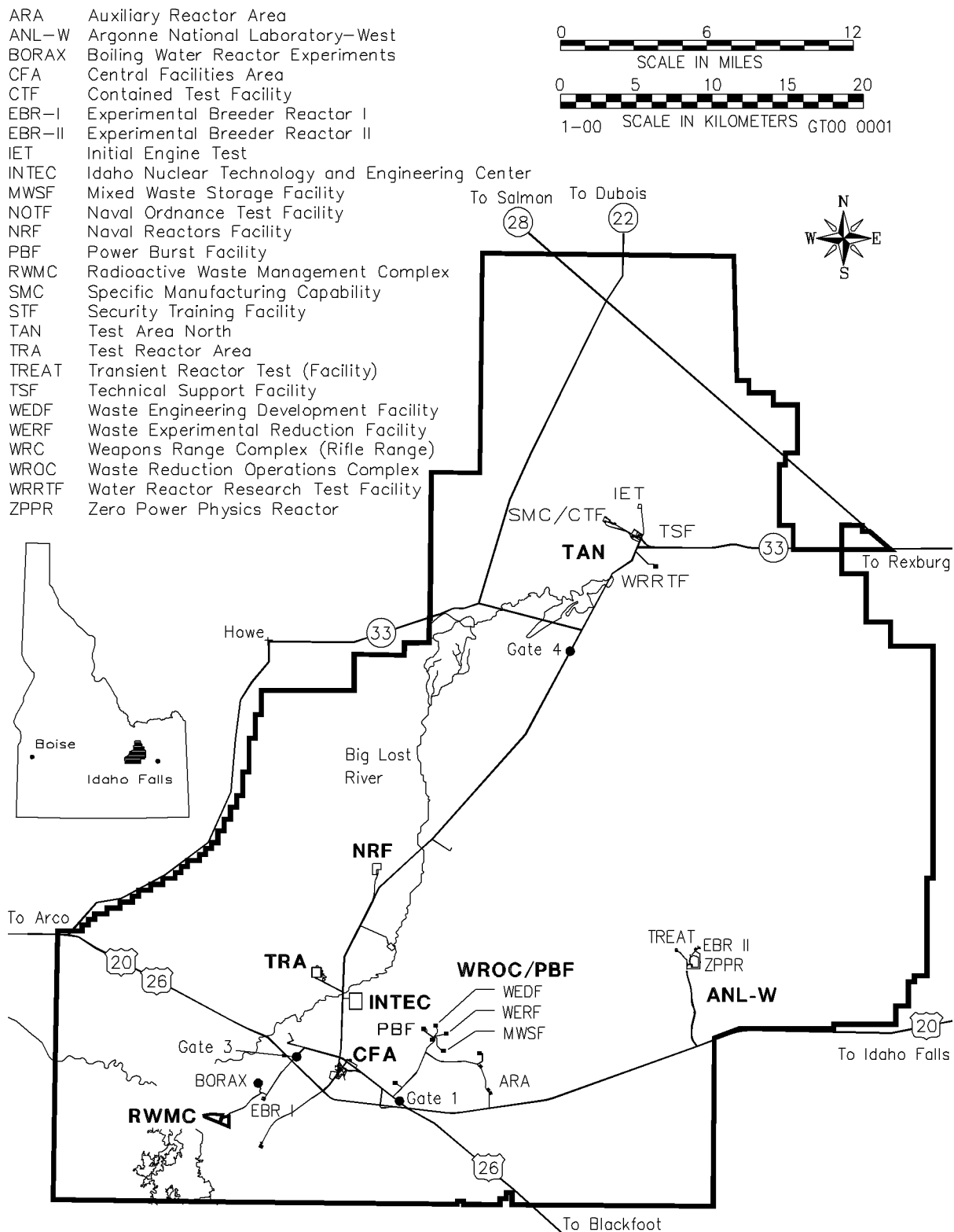


Figure 1-2. Map of the Idaho National Engineering and Environmental Laboratory.

The WAG 1 boundary includes the TSF, Initial Engine Test Facility, CTF, Specific Manufacturing Capability Facility, and WRRTF fenced areas. It also includes the immediate areas outside the fences, where operations associated with these areas might have taken place, and all surface and subsurface areas.

Waste Area Group 1 will implement the requirements delineated in the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999a). The OU 1-10 RD/RA will remediate sites shown to present unacceptable risks to human health and the environment. The areas requiring remediation include three highly contaminated sites where mixed-waste tanks are buried, buried mixed-waste tank sites, three soil sites contaminated with radionuclides or petroleum, and two burn pit sites contaminated with metals and possibly other constituents.

Waste Area Group 1 also must implement the requirements of the *Record of Decision Amendment Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action* (DOE-ID 2001) and the *Explanation of Significant Differences from the Record of Decision for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action, Operable Unit 1-07B, Waste Area Group 1* (INEEL 1997). The OU 1-07B remedial action must reduce volatile organic compound (VOC) contamination in the aquifer to below maximum contaminant levels (MCLs) using in situ bioremediation, natural attenuation, and pump and treat.

**1.2.2.2 Waste Area Group 2—Test Reactor Area.** The Test Reactor Area (TRA) was established in the early 1950s in the southwestern portion of the INEEL, approximately 76 km (47 mi) west of Idaho Falls, Idaho. The TRA houses extensive facilities for studying the effects of radiation on materials, fuels, and equipment, including high neutron-flux nuclear test reactors. Three major reactors have been built at TRA: (1) the Materials Test Reactor, (2) the Engineering Test Reactor, and (3) the Advanced Test Reactor. Currently, the Advanced Test Reactor is the only major operational reactor within TRA.

Chemical and radioactive waste is generated from scientific and engineering research at TRA. Although extracted and treated, the waste still contains low-level radioactive and chemical solutions that must be disposed of. As originally designed and installed, two separate waste streams were used at TRA: one for sanitary sewage and the other for all waste streams. Over the years, additional segregation of waste streams has taken place. Historical disposal sites for the waste include the Chemical Waste Pond, Cold Waste Pond, disposal well, retention basin, Sewage Leach Pond, and Warm Waste Pond. In addition to these sites, there have been other releases associated with spills and leaking underground storage tanks.

Potential release sites identified at TRA facilities in the FFA/CO (DOE-ID 1991a) include wastewater structures and leaching ponds, underground storage tanks, rubble piles, cooling towers, an injection well, french drains, and assorted spills. These 66 potential release sites compose 13 action OUs and one no action OU.

Possible contaminants of potential concern include petroleum products, acids, bases, polychlorinated biphenyls (PCBs), radionuclides, and metals. These contaminants of potential concern are the chemical and radioactive waste generated from the scientific and engineering research at TRA. The WAG 2 boundary includes the area within the TRA fence and the areas immediately outside the fence where waste operations have taken place. Waste Area Group 2 includes all surface and subsurface areas.

**1.2.2.3 Waste Area Group 3—Idaho Nuclear Technology and Engineering Center.**

Waste Area Group 3 is the Idaho Nuclear Technology and Engineering Center (INTEC) that houses facilities for reprocessing government defense and research spent fuel. Facilities at INTEC include spent

fuel storage and reprocessing areas, a waste solidification by calcination facility and related waste storage bins, remote analytical laboratories, and a coal-fired steam-generating plant.

The INTEC, formerly known as the Idaho Chemical Processing Plant (ICPP), is located in the south-central area of the INEEL (southeastern Idaho). Since 1952, operations at INTEC have been primarily related to the reprocessing of spent nuclear fuel from defense projects, wherein reusable uranium was extracted from the spent fuels. The DOE discontinued reprocessing at the facility in 1992. Liquid waste generated from the activities before 1992 is stored in an underground tank farm. Treatment of this waste using a calcining process was performed at the facility. That process converts the liquid to a more stable granular form; the calcined solids are then stored in stainless-steel bins. Disposition of the waste will be addressed in the INEEL High-Level Waste and Facility Disposition Environmental Impact Statement. The current mission for INTEC is to receive and temporarily store spent nuclear fuel and radioactive waste for future disposition, manage waste, and perform remedial actions.

Several phases of investigation have been performed on the OUs contained within WAG 3. A comprehensive RI/FS (OU 3-13 RI/FS) was conducted to determine the nature and extent of contamination and corresponding potential risks to human health and the environment under various exposure pathways and scenarios. Based on the RI/FS, the INTEC release sites were further segregated into seven groups to allow the development and analysis of remedial action alternatives with the sites grouped by contaminants of concern, accessibility, or geographic proximity. The groups, as identified in the *Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13* (DOE-ID 1999b), include the following:

- Group 1—Tank Farm Soils
- Group 2—Soils under Buildings and Structures
- Group 3—Other Surface Soils
- Group 4—Perched Water
- Group 5—Snake River Plain Aquifer (SRPA)
- Group 6—Buried Gas Cylinders
- Group 7—Stored Fuel Exterior (SFE) -20 Hot Waste Tank System.

In addition to the seven groups, the INEEL CERCLA Disposal Facility has been constructed outside the fence at INTEC to allow on-Site disposal of WAG 3 and other CERCLA-generated waste at the INEEL. The INEEL CERCLA Disposal Facility is an engineered facility meeting RCRA Subtitle C design and construction requirements and will consist of two cells adjacent to INTEC with a capacity of about 389,923 m<sup>3</sup> (510,000 yd<sup>3</sup>) of material.

Windblown Site CPP-95 defines the WAG 3 boundary. Waste Area Group 3 includes all surface and subsurface areas.

**1.2.2.4 Waste Area Group 4—Central Facilities Area.** Waste Area Group 4 is designated as one of the 10 WAGs located at the INEEL. Since 1949, the INEEL has conducted nuclear reactor research and testing for the U.S. Government. It is managed by the DOE, and it occupies an area of approximately 2,305 km<sup>2</sup> (890 mi<sup>2</sup>) in southeastern Idaho. Waste Area Group 4 comprises the Central

Facilities Area (CFA), which is located in the south-central portion of the INEEL (Figure 1-1). This WAG also includes areas on the outskirts of CFA (i.e., landfills, gravel pits, and surface and subsurface areas).

The original buildings at CFA, built in the 1940s and 1950s, housed Navy gunnery-range personnel, administration, shops, and warehouse space. The facilities have been modified over the years to fit changing needs and now provide four major types of functional space: (1) craft, (2) office, (3) service, and (4) laboratory. Approximately 1,028 people work at CFA. Public access to the INEEL is strictly controlled by security personnel and security measures (such as fences around sensitive facilities).

The FFA/CO (DOE-ID 1991a) identifies 52 potential release sites at WAG 4 (Figure 1-2). The types of CERCLA sites at WAG 4 include landfills, underground storage tanks, aboveground storage tanks, drywells, disposal ponds, soil contamination sites, and a sewage treatment plant. Each of these sites was placed into one of 13 OUs within the WAG, based on similarity of contaminants, environmental release pathways, and/or investigations.

**1.2.2.5 Waste Area Group 5—Power Burst Facility and Auxiliary Reactor Area.** Waste Area Group 5 is comprised of the Auxiliary Reactor Area (ARA) and Power Burst Facility (PBF); it is located in the south-central portion of the INEEL. The INEEL is located in southeastern Idaho and occupies 2,305 km<sup>2</sup> (890 mi<sup>2</sup>) in the northeastern region of the Snake River Plain (Figure 1-2). The CERCLA (42 USC § 9601 et seq.) identification number for the INEEL is 1000305. Land use at the INEEL is classified as industrial.

The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the Special Power Excursion Reactor Test (SPERT) facilities, PBF consists of five separate operational areas: (1) the PBF Control Area, (2) the PBF Reactor Area (SPERT-I), (3) the Waste Engineering Development Facility (SPERT-II), (4) the Waste Experimental Reduction Facility (SPERT-III), and (5) the Mixed Waste Storage Facility (SPERT-IV). Collectively, the Waste Experimental Reduction Facility, Waste Engineering Development Facility, and the Mixed Waste Storage Facility are known as the Waste Reduction Operations Complex.

Fifty-five potential release sites have been identified at WAG 5: 25 at ARA and 30 at PBF. The sources of contamination at ARA include past discharges to underground storage tanks, septic systems, and several surface ponds. A low-level radioactive waste landfill and a large windblown contamination area associated with the cleanup of a 1961 reactor accident also are sources within ARA. The sources of contamination at PBF include past discharges to underground storage tanks, vadose zone injection wells, septic systems, and several surface ponds.

The WAG 5 boundary encompasses the facility locations presently or historically used within the ARA and PBF areas, those immediately adjacent areas where waste activities might have taken place, and all surface and subsurface areas.

**1.2.2.6 Waste Area Group 6—Experimental Breeder Reactor No. 1.** Waste Area Group 6 currently includes 22 potential release sites divided into five OUs: OU 6-01, OU 6-02, OU 6-03, OU 6-04, and OU 6-05. Sites within these OUs include underground storage tanks, septic tanks, two reactor burial sites, a leach pond, a trash dump, a drainage ditch, and a radionuclide-contaminated soil area. Contaminants of potential concern include VOCs, semivolatile organic compounds (SVOCs), radionuclides, petroleum waste, metals, PCBs, pesticides, and herbicides. Summary assessments, Track 1 decision documentation packages, Track 2 investigations, and one RI/FS have been completed for potential release sites. The WAG 6 boundary is directly related to the Experimental Breeder Reactor (EBR)/Boiling Water Reactor Experiment (BORAX) facility locations and areas immediately adjacent to them as well as all surface and subsurface areas.

Operable Unit 6-02 comprises the BORAX-01—BORAX II-V leach pond, BORAX-03—BORAX septic tank (Argonne Experimental Facility [AEF] -703), BORAX-04—BORAX trash dump, BORAX-08—BORAX V ditch, and BORAX-09—BORAX II-V reactor building.

The BORAX-01 leach pond received reactor cooling water and cooling tower blow-down water generated during the BORAX II-V reactor program.

The BORAX-03 septic tank (AEF-703) was a 2,271-L (600-gal) concrete underground septic tank and its associated piping, distribution box, and leach field, located 15 m (50 ft) west of AEF-605. The septic system—installed in 1962 and used until 1968—received sewage from a floor drain, service sink, urinal, and commode. The septic tank and system were removed as part of 1995–1996 decontamination and decommissioning (D&D) activities.

The BORAX-04 trash dump was located 137 m (450 ft) from the northwest corner of the BORAX-V facility fence. It was used during construction, operation, and demolition of BORAX facilities from 1953 to 1964. All waste material was removed; the area was backfilled with uncontaminated soil, graded, and reseeded during 1985 D&D activities.

The BORAX-08 ditch (a newly identified site) was an unlined excavation that began approximately 12 m (40 ft) north of the AEF-601 reactor facility and measured approximately 477 m (1,565 ft) in length and 15 m (50 ft) in width at its widest point. It received waste stream effluent from the BORAX II-V reactors through a 10-cm (4-in.) raw water line to a 23-cm (9-in.) corrugated underground metal pipe. Sample analysis indicated that the ditch contained radioactive and metal contamination.

The BORAX-09 site, a newly identified site consisting of the BORAX II-V reactor facility (AEF-601/ANL-717), was the site of a series of reactor experiments conducted between 1953 and 1964. A D&D removal and containment action was conducted at BORAX-09 during 1996 and 1997 to remove RCRA (42 USC § 6901 et seq.) hazardous materials and leave this site in a safe and stable condition. A contamination source (radionuclide-contaminated soil) remains in place.

Operable Unit 6-03 consisted of 10 inactive underground storage tanks: (1) BORAX-05—BORAX fuel oil tank southwest of AEF-602, (2) BORAX-07—BORAX inactive fuel oil tank by AEF-601, (3) EBR-07—EBR-I (AEF-704) fuel oil tank at AEF-603, (4) EBR-08—EBR-I (WMO-703) fuel oil tank, (5) EBR-09—EBR-I (WMO-704) fuel oil tank at WMO-601, (6) EBR-10—EBR-I (WMO-705) gasoline tank, (7) EBR-11—EBR-I fuel oil tank (EBR-706), (8) EBR-12—EBR-I diesel tank (EBR-707), (9) EBR-13—EBR-I gasoline tank (EBR-708), and (10) EBR-14—EBR-I gasoline tank (EBR-717).

Operable Unit 6-04 consisted of the EBR-15 radionuclide-contaminated soil, comprising four regions surrounding the EBR-601 reactor facility. Samples collected from EBR-15 during OU 10-06 characterization contained radionuclide concentrations high enough to warrant accelerated cleanup. Cleanup included excavation of radionuclide-contaminated soil, approximately 980 m<sup>3</sup> (1,279 yd<sup>3</sup>), from all detectable sources within the EBR-I perimeter fence. Following radionuclide-contaminated soil excavation, samples were collected to verify that cleanup goals were met. Based on field readings, less than 0.9 m<sup>3</sup> (1 yd<sup>3</sup>) of radionuclide-contaminated soil exceeding preliminary remediation goals remains in one small area where a fence post and basalt outcropping prevented its complete removal. In addition, because the scope of OU 10-06 was radionuclide-contaminated soil, some radionuclide-contaminated piping was left underground when uncovered. A new site identification form is in progress for the underground piping to determine if the piping should become a CERCLA site. Operable Unit 6-05 is the WAG 6 comprehensive RI/FS.



**1.2.2.7 Waste Area Group 7—Radioactive Waste Management Complex.** The Radioactive Waste Management Complex (RWMC) was established in 1952; it is a controlled area used for disposal of solid radioactive waste generated during INEEL operations. The primary site being investigated is the Subsurface Disposal Area (SDA) within the RWMC. It includes numerous pits, trenches, and vaults where radioactive and organic waste was placed as well as a large pad where waste was placed above grade and covered. Since the early 1970s, the Transuranic Storage Area within the RWMC has been used for retrievable storage of transuranic waste on earthen-covered pads and in facilities.

During the preparation of the FFA/CO and development of the OUs for WAG 7, it was envisioned that a WAG 7 investigation could be based on contaminant pathways rather than contaminant sites (i.e., air pathway and vadose zone pathway), and OUs would be further subdivided into pits and trenches containing transuranic (TRU) radionuclides versus pits and trenches containing only low-level radionuclides. Based on this division of OUs, the OU 7-13 TRU pits and trenches RI/FS was established to investigate only those portions of the SDA containing buried TRU radionuclides.

Because of the similarities of all buried waste at the SDA, the Agencies have agreed that all source term and pathway OUs associated with WAG 7 will be evaluated comprehensively in the OU 7-13 RI/FS, which will also serve as the comprehensive RI/FS for WAG 7 (OU 7-14) and referred to in this document as OU 7-13/14. Waste Area Group 7 is divided into 14 OUs. The WAG 7 boundary is clearly defined as the RWMC fence, with the SDA as a fenced portion within the RWMC. It includes all surface and subsurface areas.

Pit 9, designated as OU 7-10, is located in the northeast corner of the SDA. The OU 7-10 site is an area into which chemicals, radioactive materials, and sludge from DOE weapons' plants and other government programs were disposed of. While such disposal at the RWMC began in 1952, OU 7-10 was used and filled from 1967 through 1969.

The OU 7-10 Glovebox Excavator Method Project facilities and processes will be designed to safely conduct a waste-zone material-retrieval demonstration in a selected area of Pit 9. The project's facilities will be located in this selected area of OU 7-10 and will include a Retrieval Confinement Structure, a Weather Enclosure Structure, and a provisional interim staging area. The project processes include excavation and retrieval; sampling, packaging, and interim staging; utilities; safeguards and security; and environmental monitoring. The retrieval system consists of an excavator, ventilation system, and other supporting equipment operating inside the Weather Enclosure Structure and Retrieval Confinement Structure. The Packaging Glovebox System consists of three gloveboxes in which operators examine materials, take samples, and package waste-zone material. The staging system includes a provisional interim staging area for packaged materials. Facility D&D&D activities are included in the scope of the Glovebox Excavator Method Project.

**1.2.2.8 Waste Area Group 10—Miscellaneous Sites.** Waste Area Group 10 includes miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included within other WAGs. Waste Area Group 10 also includes regional INEEL-related SRPA concerns that cannot be addressed on a WAG-specific basis. Specific sites currently recognized as part of WAG 10 include the Liquid Corrosive Chemical Disposal Area (LCCDA), the Organic-Moderated Reactor Experiment (OMRE), and former ordnance sites. (See Table 1-1 for additional information on each WAG.)

Operable Unit 10-01 is comprised of two disposal pits (LCCDA-01 and LCCDA-02) that are located in the southwest corner of the INEEL, approximately 1 km (0.6 mi) east of the main RWMC entrance. The LCCDA pits were used primarily to dispose of solid disposal and liquid corrosive

Table 1-1. References for problem description/background for each waste area group.

Waste Area Group	Reference
1	<i>Remedial Investigation Final Report with Addenda for the Test Area North Groundwater Operable Unit 1-07B at the Idaho National Engineering Laboratory</i> (Kaminsky et al. 1994)
1	<i>Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory</i> (DOE-ID 1997a)
1	<i>Remedial Investigation/Feasibility Study Work Plan and Addenda for the Test Area North Groundwater Operable Unit at the Idaho National Engineering Laboratory</i> (Zimmerle 1992)
2	<i>Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory</i> (DOE-ID 1997b)
2	<i>Remedial Investigation Report for the Test Reactor Area Perched Water System (Operable Unit 2-12)</i> (Lewis et al. 1992)
3	<i>Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part A, RI/BRA Report (Final)</i> (DOE-ID 1997c)
3	<i>Comprehensive RI/FS for the Idaho Chemical Processing Plant (ICPP) OU 3-13 at the INEEL—Part B FS Report (Final)</i> (DOE-ID 1997d)
3	<i>Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13</i> (DOE-ID 1999b)
4	<i>Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13 at the Idaho National Engineering and Environmental Laboratory</i> (DOE-ID 2000)
4	<i>Remedial Investigation/Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory—Volume I: Remedial Investigation</i> (Keck et al. 1995) and <i>Remedial Investigation/Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory—Volume II: Feasibility Study</i> (Dames & Moore 1995)
5	<i>Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study</i> (DOE-ID 1999c)
6	<i>Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study</i> (DOE-ID 1999d)
7	<i>Record of Decision Declaration for Pad A at the Radioactive Waste Management Complex Subsurface Disposal Area</i> (DOE-ID 1994a)
7	<i>Record of Decision Declaration for Organic Contamination in the Vadose Zone Operable Unit 7-08</i> (DOE-ID 1994b)
7	<i>Remedial Action Report Pad A Limited Action, Operable Unit 7-12</i> (Parsons Corporation 1995)
7	<i>Final Remedial Design/Remedial Action Workplan, Organic Contamination in the Vadose Zone, Operable Unit 7-08, Radioactive Waste Management Complex Subsurface Disposal Area</i> (Sciencetech 1995)
7	<i>Work Plan for Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study</i> (Becker et al. 1996)
7	<i>Addendum to the Work Plan for the Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study</i> (DOE-ID 1998)
7	<i>Work Plan for Stage I of the Operable Unit 7-10 Staged Interim Action</i> (DOE-ID 1999e)

ICPP = Idaho Chemical Processing Plant  
 INEEL = Idaho National Engineering and Environmental Laboratory  
 OU = operable unit  
 RI/BRA = remedial investigation/baseline risk assessment  
 RI/FS = remedial investigation/feasibility study

chemicals (such as nitric acid, sulfuric acid, and sodium hydroxide). A solitary disposal request uncovered as part of the Track 2 investigation suggested that some organics might have been disposed of at LCCDA, though sample results from the same investigation indicated that no SVOCs or VOCs are present.

Operable Unit 10-02 comprises the OMRE-1 leach pond. The OMRE was a 12-MW thermal reactor that was operated between 1957 and 1963, located in the southern portion of the INEEL approximately 6.25 km (2 mi) east of CFA. The reactor coolant consisted primarily of high-boiling-point organic compounds similar to wax; however, neutron bombardment degraded some compounds to low-boiling-point organics, including VOCs and SVOCs. Decomposition waste removed during periodic purification was not discharged to the pond, but large quantities of radioactive wastewater, possibly contaminated with organic coolant and decomposition waste, were discharged to the pond.

Operable Unit 10-03 comprises all ordnance sites, including OU 10-05 sites, at the INEEL that are known or suspected to be contaminated with unexploded ordnance and high explosive residue from activities associated with the former Naval Proving Ground.

In 1993, an interim action (OU 10-05) on six ordnance sites was performed. The six sites included the CFA gravel pit (ORD-04), the explosive bunkers north of INTEC (ORD-07), the National Oceanic and Atmospheric Administration grid (ORD-08), the CFA-633 area (ORD-03), the Fire Station II area (ORD-10), and the Anaconda Power Line (ORD-11) road. The goals of the interim action were to remove unexploded ordnance and ordnance explosive waste to a depth of 0.61 m (2 ft) at each site and to remediate soil containing greater than 44 parts per million (ppm) of trinitrotoluene or greater than 18 ppm of cyclotrimethylene trinitroamine (research development explosive). Approximately 185 yd<sup>3</sup> (686 drums) of explosive-contaminated soil was excavated and sent off-Site for incineration. No unexploded ordnance or ordnance explosive waste was encountered at this time at the CFA gravel pit or the explosive storage bunkers.

Operable Unit 10-04 included the Security Training Facility (STF) -601 sumps and pits and the STF gun range. Building 601 and the sumps and pits have been remediated under the D&D Program. The security force used the gun range for several years for small caliber handguns. Approximately 4 to 5 million rounds were fired into the berm. Most rounds were confined to the north berm, but scattered lead is apparent in outlying areas. The berm is approximately 3 to 3.7 m (10 to 12 ft) high, 6.1 to 7.6 m (20 to 25 ft) wide at the bottom, and 3 m (6 ft) wide at the top. The side berms (east and west) are approximately 61 m (200 ft) long and the north berm is approximately 76 m (250 ft) long.

Operable Unit 10-05 consisted of an interim action for unexploded ordnance at six sites. These six sites are included as a subset of OU 10-03, which includes all ordnance areas located at the INEEL including the Naval Ordnance Disposal Area.

Operable Unit 10-06 (newly identified site) is comprised of miscellaneous radionuclide-contaminated soil areas and areas of windblown contamination.

Operable Unit 10-07 (newly identified site) consists of a buried telecommunications cable installed in the early 1950s. The cable, approximately 5 cm (2 in.) in diameter, consists of copper wiring with paper insulation enclosed by a 0.32-cm (1/8-in.) thick lead sheathing wrapped in spiraled steel and enclosed in jute wrapping impregnated with an asphalt-like substance. The cable is buried approximately 0.9 to 1.2 m (3 to 4 ft) deep, parallel to and approximately 91 m (100 yd) east of Lincoln Boulevard on the INEEL. The cable originates at CFA and runs along Lincoln Boulevard to TAN. In the spring of 1990, U.S. West Communications cut the cable to render it useless.

Operable Unit 10-08 includes the SRPA and newly identified sites.

### **1.2.3 Overview of Deactivation, Decontamination, and Decommissioning**

The Inactive Sites Department is responsible for administration of the INEEL D&D&D Program. The INEEL D&D&D Program currently involves inactive, radiologically contaminated NE-ID facilities that are managed by the INEEL contractor. The facilities have been declared surplus and have been deactivated. Deactivation involves placing a facility in a safe and stable condition to minimize long-term surveillance, maintenance, and environmental impacts.

The D&D&D Program includes surplus facilities located at TAN, TRA, INTEC, CFA, PBF, ARA, STF, RWMC, and the experimental areas located near the RWMC. Areas assigned to Argonne National Laboratory-West and the Naval Reactors Facility are excluded from the program.

The D&D&D process involves radiological surveys and chemical sampling and analysis to characterize the facility. It also involves planning and preparation of safety and characterization documentation that includes a decision analysis to determine the preferred mode for D&D&D and a D&D&D plan for the facility dismantlement activities resulting in the released site followed by a final project report. All D&D&D activities involving data collection and analysis are conducted in accordance with this QAPjP.

### **1.2.4 Site-Specific Information**

Site-specific information, including a site map for each project using this QAPjP, will be included in the site background section of the project-specific FSP or other appropriate documentation (e.g., test plan, RD/RA work plans).

## **1.3 Project Plans**

This section provides a background of the projects and the types of activities to be conducted, including the measurements that may be taken and the associated QA/QC goals, procedures, and timetables for collecting measurements. Project-specific documents will list the QA/QC goals, procedures, and timetables for collecting the measurements. The discussion in this QAPjP is limited to the generic types of activities that might occur at any CERCLA OU, goals, procedures, and measurements. The generic timetable is provided in the *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991b). A brief description of a RI/FS and D&D&D activity is used for an example. The present RI/FS work plans are provided in Table 1-1 for reference. Additional information will be found in individual RODs, when approved.

### **1.3.1 Remedial Investigation/Feasibility Studies and Deactivation, Decontamination, and Decommissioning Plans**

The environmental problems and background associated with each facility are addressed in the individual RI/FS work plans, RD/RA work plans, RODs, D&D&D plans, FSP, operation and maintenance plans, and associated environmental documentation. In general, those problems include low-level radiological contamination, asbestos, lead, metals, inorganic and organic contamination, and fugitive dusts. For specific problems and background, see the project-specific plans.

A variety of measurements is necessary during any field activity at one of the OUs. Typical measurements include radiological screening for contamination, using field instrumentation and possibly

radiochemistry analyses of samples collected at a laboratory. Other necessary measurements include vapor badge analyses for worker safety; organic and inorganic analyses of collected samples, using field instruments to check for absence or presence of organics; and visual examinations of the soil.

Other measurements likely during different processes under CERCLA are physical properties of soil, sludge, and debris. Those measurements might be field tests or might require the use of an analytical laboratory, depending on the DQOs. The test/analytical methods are listed and discussed in Section 2 of this QAPjP. Project-specific FSPs, test plans, and other work-controlling documents provide the tests and analyses required for that activity.

Applicable technical quality standards or criteria are defined during the CERCLA processes using applicable or relevant and appropriate requirements. Records of Decision and other primary and secondary FFA/CO documents define the regulatory framework associated with the individual or group of OUs. The DQO action levels may be included as applicable or relevant and appropriate requirements.

Any special equipment or personnel requirements will be specified in the FSPs, RD/RA work plan, D&D plans, or other work-authorizing documents. Special personnel requirements usually involve additional training and qualification requirements. Specialized equipment might be needed during any FFA/CO process. Those specialized needs will be addressed by the project-specific documentation and will be translated to procurement specifications to obtain the equipment. Specialized equipment includes confinement enclosures, remote-handling equipment, or refined field instrumentation.

The degree of quality assurance (QA) assessment activity for any project will depend on the complexity, duration, and objectives of that project. The FSP, test plan, or other work-controlling documents will specify the minimum-assessment activity requirements. Generally, one QA assessment should be done at each project. The exception to the rule is D&D&D projects, where the D&D&D project manager requests the assessment, if deemed necessary. In addition to QA assessments, the field team leader (FTL) completes an FTL checklist at the start of each field activity. The checklist is used to evaluate team preparedness to start a sampling activity. Similar preparedness reviews are done for D&D&D, remedial investigation (RI), and post-ROD projects.

Records generated during all CERCLA and D&D processes are retained using an Optical Imaging System (OIS). Typical records include RODs, FSPs, RI/FS work plans, RD/RA work plan, RI report, summary reports, limitations and validation (L&V) reports, risk assessments, community relations' plans, and other documents discussed in Section XX, "Retention of Records and Administrative Record," of the FFA/CO (DOE-ID 1991a).

### **1.3.2 Schedule**

The work schedule for all WAG 1, 2, 3, 4, 5, 6, 7, and 10 activities is outlined in Appendix A of the *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991b). Project-specific schedules are included in the individual scopes of work, which are prepared jointly by the project managers.

## **1.4 Guidance for the Data Quality Objective Process**

The DQOs are qualitative and quantitative terms used to define the requirements for data collected during an environmental investigation or remediation. The DQO development process is mandatory systematic planning used to establish which data are required and to determine the performance criteria for the measurement system that will be used in generating the data. The *Guidance for the Data Quality*

*Objective Process* (EPA 1994) provides guidance on developing DQOs. Specific DQOs are stated and discussed in detail in the applicable FSP, test plans, and work plans.

The seven steps, with a brief explanation of each, are as follows:

1. **State the problem.** Concisely describe the problem to be studied. Review prior studies and existing information to gain an acceptable understanding of the problem.
2. **Identify the decision.** Using new data, identify the decision that will solve the problem.
3. **Identify the inputs to the decision.** Identify the information that needs to be learned and the measurements that need to be taken in order to resolve the decision.
4. **Define the study boundaries.** Specify the conditions (time periods and situations) to which decisions will apply and within which the data should be collected.
5. **Develop a decision rule.** Integrate the outputs from previous steps into an “if...then” statement that defines the conditions that would cause the decision-maker to choose among alternative actions.
6. **Specify acceptable limits on decision errors.** Define the decision-maker’s acceptable decision error rates based on a consideration of the consequences of making an incorrect decision. A decision error rate is the probability of making an incorrect decision based on data that inaccurately estimate the true state of nature (EPA 1994).
7. **Optimize the design.** Evaluate information from the previous steps and generate alternative sampling designs. Choose the most resource-efficient design that meets all DQOs.

#### 1.4.1 Project Quality Objectives

The QA objectives are specifications that measurements must meet to produce acceptable data for the project. The technical and statistical qualities of those measurements must be documented properly. Precision, accuracy, method detection limits, and completeness must be specified for physical/chemical measurements. Additional analytical requirements are described qualitatively in terms of representativeness and comparability. The QA objectives are needed for all critical measurements and for each type of sample matrix (EPA 1991a, page 17). This QAPjP is designed to cover a wide variety of sampling activities. In many cases, the statistical analyses required to evaluate the QA objectives might not be appropriate for a limited data set produced during some investigations. Therefore, QA objectives specified throughout this section are assumed to meet project objectives and DQOs, unless otherwise specified in the project-specific FSP, test plan, or work plan; they are applicable to mobile and on- and off-Site fixed laboratories. A discussion of whether the project DQOs have been met and the impacts on the decision process will be included in the project report (e.g., RI report, summary report, and remedial action [RA] reports). Some field measurements (e.g., down-hole logging and in situ gamma measurements) are neither screening nor definitive, as defined herein. Not all QA/QC elements are attainable. For those data, QA/QC requirements are established in the individual work documents.

#### 1.4.2 Analytical Data Categories

The EPA has defined two analytical data categories that correspond to data uses, primarily through the decision-maker’s acceptable limits on decision errors (EPA 1993a, pages 42–44). The project-specific

FSP or test plan will designate the data categories of the analyses to be conducted for that project. The two Superfund data categories are listed below:

- Screening data with definitive confirmation
- Definitive data.

The two data categories are associated with specific QA/QC elements and may be generated using a wide range of analytical methods. The particular type of data to be generated depends on the qualitative and quantitative DQOs developed during application of the DQO process. The decision on the type of data to be collected should not be made until Step 7 of the DQO process. The EPA definitions give no allowance for testing geological properties, widely used in RD/RA activities. Therefore, the definitions below have been expanded from the EPA definitions to include allowances for these data and their potential use and inclusion as definitive data.

### **1.4.3 Screening Data with Definitive Confirmation**

**1.4.3.1 Definition of Screening Data.** Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures, such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte or property identification and quantification, though the quantification might be relatively imprecise. The EPA definition states that at least 10% of the screening data are confirmed using analytical method and QA/QC procedures and criteria associated with definitive data. It further states that screening data without associated confirmation data are not considered to be data of known quality. There are cases where it may be appropriate for ICP projects to collect screening data with no associated confirmation data. As the technology for field analytical determinations advances, it is likely that data that would meet the definition of screening data could be considered data of known quality (when a project's objectives are less likely to be associated with a potential enforcement action [e.g., a research project]). The FSPs prepared for individual projects will specify if confirmatory definitive data will be produced when screening data are used for the project.

**1.4.3.2 Screening Data Quality Assurance/Quality Control Elements.** The following are screening data QA/QC elements:

- Sample documentation (e.g., location, date and time collected, batch).
- Chain of custody (when appropriate).
- Sampling design approach (e.g., systematic, simple or stratified random, judgmental).
- Initial and continuing calibration (when applicable).
- Determination and documentation of detection limits.
- Analyte(s) or property identification.
- Analyte(s) or property quantification.

- Analytical error determination:<sup>b</sup> An appropriate number of replicate aliquots, as specified in the FSP, are taken from at least one thoroughly homogenized sample, the replicate aliquots are analyzed, and standard laboratory quality control (QC) parameters (such as variance, mean, and coefficient of variance) are calculated and compared to method-specific performance requirements specified in the FSP.
- Definitive confirmation: The EPA definition states that at least 10% of the screening data must be confirmed with definitive data, as described below. At least three screening samples reported above the action level, if any, and three screening samples reported below the action level (or as nondetects [NDs]) should be randomly selected from the appropriate group and confirmed. If definitive confirmation data will not be obtained and used as confirmation of the screening data collected for a project, then the rationale behind this decision will be discussed in the FSP.

#### 1.4.4 Definitive Data

**1.4.4.1 Definition of Definitive Data.** Definitive data are generated, using rigorous analytical methods, such as approved EPA or American Society for Testing and Materials (ASTM) reference methods or well-established and documented test methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, and digital values) in the form of paper printouts or computer-generated files. In the case of physical property measurements, where digital values are often not obtained from an instrument, analyst observations are documented in logbooks. Data may be generated at the site or at an off-Site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined.

**1.4.4.2 Definitive Data Quality Assurance/Quality Control Elements.** The following are definitive data QA/QC elements:

- Sample documentation (e.g., location, date and time collected, batch).
- Chain of custody (when appropriate).
- Sampling design approach (e.g., systematic, simple or stratified random, judgmental).
- Initial and continuing calibration (when applicable).
- Determination and documentation of detection limits.
- Analyte(s) or property identification.
- Analyte(s) or property quantification.
- QC blanks (trip, method, and rinsate), when applicable and as stated in this QAPjP.
- Matrix spike recoveries (when applicable to the analytical method).
- Performance evaluation (PE) samples (in accordance with Section 1.4.5.2.1 of this QAPjP).

---

b. The procedures identified here measure the analytical method's precision and are required when total measurement error is not determined under the confirmation step.



- Analytical error determination (measures precision of analytical method): A predetermined number of replicate aliquots—as specified in the analytical method, statement of work (SOW) to the laboratory, or FSP—are taken from at least one appropriately subsampled sample. The replicate aliquots are analyzed, and standard laboratory QC parameters (such as variance, mean, and coefficient of variation) are calculated and compared to method-specific performance requirements defined in the laboratory SOW, the analytical method, FSP, or this QAPjP.
- Total measurement error determination (measures overall precision of measurement system from sample acquisition through analysis): An appropriate number of collocated samples as determined by the FSP, using Table 2-1 as guidance, is collected independently from the same location and analyzed following standard operating procedures (SOPs). Based on those analytical results, standard laboratory QC parameters (such as variance, mean, and coefficient of variation) should be calculated and compared to established measurement error goals. That procedure may be required for each matrix under investigation and may be repeated for a given matrix at more than one location at the site.

#### 1.4.5 Impact of Data Categories on Existing Superfund Guidance

The data categories identified in Section 1.4.2 of this QAPjP replace references to analytical levels, QA objectives, and data use categories. The major documents impacted by the data categories are listed below:

- *Data Quality Objectives for Remedial Response Activities: Development Process and Case Studies* (EPA 1987a)
- *Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures* (EPA 1990)
- *Guidance for Performing Site Inspections Under CERCLA* (EPA 1992).

The quantitative QA parameters are precision, accuracy, and completeness. The qualitative QA parameters are comparability and representativeness.

**1.4.5.1 Precision.** Precision is a measure of agreement among replicate measurements of the same property under prescribed similar conditions (EPA 1998a, page D-1). This agreement is calculated as either relative percent difference (RPD) for two measurements or relative standard deviation (RSD) for three or more measurements. The formulas for calculating RPD and RSD are provided in Section 4.3 of this QAPjP.

**1.4.5.1.1 Laboratory Precision**—Laboratory precision will be calculated as defined in Section 4.3.2.1 of this QAPjP. When the EPA Contract Laboratory Program (CLP) methods are used for organic analyses, precision goals for the analytes that have EPA-established precision criteria will be provided within those in the *Statement of Work for Organic Analysis-Multi-Media, Multi-Concentration* (EPA 1999). Those criteria are listed in Tables 1-2, 1-3, and 1-4. When other organic analysis methods are used, precision goals will be established consistent with the method's published criteria for precision data (when available). The EPA has established precision goals for inorganic CLP methods (EPA 1993b) and radiological analyses in the Sample and Analysis Management (SAM) Analytical Services SOW.<sup>c</sup>

---

c. The SAM Program was formerly called the Sample Management Office.

**1.4.5.1.2 Field Precision**—Field precision is a measure of the variability not due to laboratory or analytical methods. Three sources of field variability or heterogeneity are spatial (population) and between-samples and within-sample heterogeneity (Harris 1990, Section 6.1, pages 1–5). Although the between-sample and within-sample heterogeneity can be evaluated individually using duplicate and split samples, overall field precision will be calculated as the RPD or RSD of field duplicates, as defined in Section 2.3 of this QAPjP. Given the number of duplicate and/or split samples collected and the confidence level required, an estimate of the precision may be developed. A project’s required confidence levels should be documented when deviating from the frequencies specified in Table 1-5.

**1.4.5.2 Accuracy.** Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations (EPA 1998a, page D-2).

**1.4.5.2.1 Laboratory Accuracy**—The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for those analytical methods on similar sample matrices (ER-SOW-394). Tables 1-2, 1-3, and 1-4 reflect the matrix spike (MS) percent recovery control limits for organic analyses, as defined by the *Statement of Work for Organic Analysis-Multi-Media, Multi-Concentration* (EPA 1999). The MS recovery (i.e., laboratory accuracy for organic analyses) must be within those control limits or the data flagged and data use must be evaluated. No action is taken on matrix spike/matrix spike duplicate data alone. However, the MS and matrix spike duplicate results may be used during data review in conjunction with other QC criteria to determine the need for qualifying the data. Subsequent use of flagged data should be evaluated.

Laboratory accuracy for inorganic analyses’ data is assessed using one or more of three possible QC elements (i.e., laboratory control sample [LCS], MS sample, and PE sample). The control limits for LCS and MS samples vary depending on test conditions (e.g., sample matrix and analysis method); therefore, they are not listed in this QAPjP. They are defined in the “Idaho National Engineering and Environmental Laboratory Sample and Analysis Management Statement of Work for Analytical Services” (ER-SOW-394) and the specific test methods. The PE samples have certified control limits established by their associated vendors.

Laboratory accuracy for radiological analysis is assessed (as applicable) through laboratory control samples, radiometric tracers/chemical carriers, and/or blind PE samples. Assessment of these parameters and associated control limits is described in Technical Procedure (TPR) –80, “Radioanalytical Data Validation.”

Laboratory analytical method QC samples are analyzed as required by the “Idaho National Engineering and Environmental Laboratory Sample and Analysis Management Statement of Work for Analytical Services” (ER-SOW-394) and/or the project-specific task order statement of work (TOS). The SAM Program uses the PE samples analyzed for nonradiological parameters to help evaluate laboratory accuracy.

Double blind and single blind PE samples are used as real-time tools to evaluate analytical discipline and method-specific laboratory performance. Soil and water samples will be submitted blind to the analytical laboratories with batches of field samples so that they are processed simultaneously with the field samples in the laboratory. The recommended frequency of use for these materials is one per project per matrix or one per 40 field samples of like matrix, whichever is greater. Inclusion of PE samples in a sampling project is a project management decision; therefore, the frequency of including PE samples in a project shall be included in the FSP.

Table 1-2. Contract Laboratory Program volatile-organic target compound list.

Compound	CAS <sup>a</sup> Number	CRQL			QC Limits			
		Water (µg/L)	Low Soil (µg/kg)	Med. Soil <sup>b</sup> (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Acetone	67-64-1	10	10	1,300	—	—	—	—
Benzene <sup>c,d,e</sup>	71-43-2	10	10	1,300	76–127	11	66–142	21
Bromodichloromethane <sup>e</sup>	75-27-4	10	10	1,300	—	—	—	—
Bromoform <sup>e</sup>	75-25-2	10	10	1,300	—	—	—	—
Bromomethane <sup>e</sup>	74-83-9	10	10	1,300	—	—	—	—
2-Butanone	78-93-3	10	10	1,300	—	—	—	—
Carbon disulfide	75-15-0	10	10	1,300	—	—	—	—
Carbon tetrachloride <sup>c,d,e</sup>	56-23-5	10	10	1,300	—	—	—	—
Chlorobenzene <sup>d</sup>	108-90-7	10	10	1,300	75–130	13	60–133	21
Chloroethane	75-00-3	10	10	1,300	—	—	—	—
Chloroform <sup>d</sup>	67-66-3	10	10	1,300	—	—	—	—
Chloromethane <sup>d</sup>	74-87-3	10	10	1,300	—	—	—	—
Cis-1,2-dichloroethene <sup>c</sup>	156-59-2	10	10	1,300	—	—	—	—
Cis-1,3-dichloropropene <sup>e</sup>	10061-01-5	10	10	1,300	—	—	—	—
Cyclohexane	110-82-7	10	10	1,300	—	—	—	—
Dibromochloromethane <sup>e</sup>	124-48-1	10	10	1,300	—	—	—	—
1,2-Dibromo-3-chloropropane <sup>c</sup>	96-12-8	10	10	1,300	—	—	—	—
1,2-Dibromoethane <sup>c</sup>	106-93-4	10	10	1,300	—	—	—	—
1,2-Dichlorobenzene <sup>f</sup>	95-50-1	10	10	1,300	—	—	—	—
1,3-Dichlorobenzene <sup>f</sup>	541-73-1	10	10	1,300	—	—	—	—
1,4-Dichlorobenzene <sup>c,f</sup>	106-46-7	10	10	1,300	—	—	—	—
Dichlorodifluoromethane	75-71-8	10	10	1,300	—	—	—	—
1,1-Dichloroethane <sup>c</sup>	75-34-3	10	10	1,300	—	—	—	—
1,2-Dichloroethane <sup>c,d,e</sup>	107-06-2	10	10	1,300	—	—	—	—
1,1-Dichloroethene <sup>c,d,e</sup>	75-35-4	10	10	1,300	61–145	14	59–172	22
1,2-Dichloroethene (total) <sup>e</sup>	540-59-0	10	10	1,300	—	—	—	—
1,2-Dichloropropane <sup>c,d,e</sup>	78-87-5	10	10	1,300	—	—	—	—
Ethylbenzene	100-41-4	10	10	1,300	—	—	—	—
2-Hexanone	591-78-6	10	10	1,300	—	—	—	—
Isopropylbenzene	98-82-8	10	10	1,300	—	—	—	—
4-Methyl-2-pentanone	108-10-1	10	10	1,300	—	—	—	—
Methyl acetate	79-20-9	10	10	1,300	—	—	—	—
Methylcyclohexane	108-87-2	10	10	1,300	—	—	—	—

Table 1-2. (continued).

Compound	CAS <sup>a</sup> Number	CRQL			QC Limits			
		Water (µg/L)	Low Soil (µg/kg)	Med. Soil <sup>b</sup> (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Methylene chloride <sup>c,d,e</sup>	75-09-2	10	10	1,300	—	—	—	—
Methyl tert-butyl ether	1634-04-4	10	10	1,300	—	—	—	—
Styrene	100-42-5	10	10	1,300	—	—	—	—
1,1,2,2-Tetrachloroethane <sup>c</sup>	79-34-5	10	10	1,300	—	—	—	—
Tetrachloroethene <sup>e,d,e</sup>	127-18-4	10	10	1,300	—	—	—	—
Toluene	108-88-3	10	10	1,300	76–125	13	59–139	21
Trans-1,2-dichloroethene	156-60-5	10	10	1,300	—	—	—	—
Trans-1,3-dichloropropene <sup>d,e</sup>	10061-02-6	10	10	1,300	—	—	—	—
1,2,4-Trichlorobenzene <sup>c,f</sup>	120-82-1	10	10	1,300	—	—	—	—
1,1,1-Trichloroethane	71-55-6	10	10	1,300	—	—	—	—
1,1,2-Trichloroethane <sup>c,d,e</sup>	79-00-5	10	10	1,300	—	—	—	—
Trichloroethene <sup>c,d,e</sup>	79-01-6	10	10	1,300	71–120	14	62–137	24
Trichlorofluoromethane	75-69-4	10	10	1,300	—	—	—	—
1,1,2-Trichloro-1,1,2-trifluoroethane	76-13-1	10	10	1,300	—	—	—	—
Vinyl chloride <sup>c,d,e</sup>	75-01-4	10	10	1,300	—	—	—	—
Xylene (total) <sup>d</sup>	1330-20-7	10	10	1,300	—	—	—	—

a. CAS = Chemical Abstract Service

b. The term “medium soil” refers to contaminant concentrations in the soil. The CLP method includes a preanalysis screening protocol where samples screened with volatile organic analytes at >2,000 µg/kg are analyzed using the medium-level protocol. The medium-level protocol has an elevated CRQL, as indicated by the table. Information known about samples that will be close to, or exceed, the 2,000-µg/kg level should be provided to the SAM Program during laboratory acquisition and to the laboratory on chain-of-custody forms sent with the samples.

c. This compound is regulated under the National Primary Drinking Water Regulations and one-tenth of the MCL is less than the listed CRQL for water samples. When MCLs are a project applicable or relevant and appropriate requirement, the CLP method should not be used for water samples. When lower detection limits are required for water samples, they must be analyzed using EPA Method 8260B with a 25-mL purge volume or EPA Method 524.2 (see Table 1-8).

d. The water sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for tap water, as specified in the EPA Region IX PRGs. When lower detection limits are required for water samples, they must be analyzed using EPA Method 8260B with a 25-mL purge volume or EPA Method 524.2 (see Table 1-8).

e. The low soil sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for residential soil, as specified in the EPA Region IX PRGs. When lower detection limits are required for soil samples, contact SAM personnel to discuss alternative methods.

f. The CLP identifies this as a volatile compound; it may be analyzed as a semivolatile compound.

%R = percent recovery

CLP = Contract Laboratory Program

CRQL = contract-required quantification limit

EPA = U.S. Environmental Protection Agency

MCL = maximum contaminant level

PRG = preliminary remediation goal

QC = quality control

RPD = relative percent difference

SAM = Sample and Analysis Management

Table 1-3. Contract Laboratory Program semivolatile organic target-compound list.

Compound	CAS Number	CRQL <sup>a</sup>			QC Limits			
		Water (µg/L)	Low Soil (µg/kg)	Med. Soil (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Acenaphthene	83-32-9	10	330	10,000	46–118	31	31–137	19
Acenaphthylene	208-96-8	10	330	10,000	—	—	—	—
Acetophenone	98-86-2	10	330	10,000	—	—	—	—
Anthracene	120-12-7	10	330	10,000	—	—	—	—
Atrazine	1912-24-9	10	330	10,000	—	—	—	—
Benzaldehyde	100-52-7	10	330	10,000	—	—	—	—
Benzo(a)anthracene <sup>c,d</sup>	56-55-3	10	330	10,000	—	—	—	—
Benzo(b)fluoranthene <sup>c,d</sup>	205-99-2	10	330	10,000	—	—	—	—
Benzo(k)fluoranthene <sup>c</sup>	207-08-9	10	330	10,000	—	—	—	—
Benzo(g,h,i)perylene	191-24-2	10	330	10,000	—	—	—	—
Benzo(a)pyrene <sup>b,c,d</sup>	50-32-8	10	330	10,000	—	—	—	—
1,1'-Biphenyl	92-52-4	10	330	10,000	—	—	—	—
Bis (2-chloroethyl) ether <sup>c,d</sup>	111-44-4	10	330	10,000	—	—	—	—
Bis (2-chloroethoxy) methane	111-91-1	10	330	10,000	—	—	—	—
Bis (2-ethylhexyl) phthalate <sup>c,d</sup>	117-81-7	10	330	10,000	—	—	—	—
4-Bromophenyl-phenylether	101-55-3	10	330	10,000	—	—	—	—
Butylbenzylphthalate	85-68-7	10	330	10,000	—	—	—	—
Carbazole <sup>c</sup>	86-74-8	10	330	10,000	—	—	—	—
Caprolactam	105-60-2	10	330	10,000	—	—	—	—
4-Chloroaniline	106-47-8	10	330	10,000	—	—	—	—
4-Chloro-3-methylphenol	59-50-7	10	330	10,000	23–97	42	26–103	33
2-Chloronaphthalene	91-58-7	10	330	10,000	—	—	—	—
2-Chlorophenol <sup>c</sup>	95-57-8	10	330	10,000	27–123	40	25–102	50
4-Chlorophenyl-phenylether	7005-72-3	10	330	10,000	—	—	—	—
Chrysene <sup>c</sup>	218-01-9	10	330	10,000	—	—	—	—
Dibenzo(a,h)anthracene <sup>c,d</sup>	53-70-3	10	330	10,000	—	—	—	—
Dibenzofuran <sup>c</sup>	132-64-9	10	330	10,000	—	—	—	—
1,2-Dichlorobenzene <sup>b, c</sup>	95-50-1	10	330	10,000	—	—	—	—
1,3-Dichlorobenzene <sup>d, c</sup>	541-73-1	10	330	10,000	—	—	—	—
1,4-Dichlorobenzene <sup>b, c, d, c</sup>	106-46-7	10	330	10,000	36–97	28	28–104	27
3,3'-Dichlorobenzidine <sup>c,d</sup>	91-94-1	10	330	10,000	—	—	—	—
2,4-Dichlorophenol	120-83-2	10	330	10,000	—	—	—	—

Table 1-3. (continued).

Compound	CAS Number	CRQL <sup>a</sup>			QC Limits			
		Water (µg/L)	Low Soil (µg/kg)	Med. Soil (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Diethylphthalate	84-66-2	10	330	10,000	—	—	—	—
2,4-Dimethylphenol	105-67-9	10	330	10,000	—	—	—	—
Dimethylphthalate	131-11-3	10	330	10,000	—	—	—	—
Di-n-butylphthalate	84-74-2	10	330	10,000	—	—	—	—
Di-n-octylphthalate	117-84-0	10	330	10,000	—	—	—	—
2,4-Dinitrophenol <sup>c</sup>	51-28-5	25	830	25,000	—	—	—	—
4,6-Dinitro-2-methylphenol	534-52-1	25	830	25,000	—	—	—	—
2,4-Dinitrotoluene <sup>c</sup>	121-14-2	10	330	10,000	24–96	38	28–89	47
2,6-Dinitrotoluene <sup>c</sup>	606-20-2	10	330	10,000	—	—	—	—
Fluoranthene	206-44-0	10	330	10,000	—	—	—	—
Fluorene	86-73-7	10	330	10,000	—	—	—	—
Hexachlorobenzene <sup>b</sup>	118-74-1	10	330	10,000	—	—	—	—
Hexachlorobutadiene <sup>c</sup>	87-68-3	10	330	10,000	—	—	—	—
Hexachloroethane <sup>c</sup>	67-72-1	10	330	10,000	—	—	—	—
Hexachlorocyclopentadiene <sup>b</sup>	77-47-4	10	330	10,000	—	—	—	—
Indeno(1,2,3-cd)pyrene <sup>c,d</sup>	193-39-5	10	330	10,000	—	—	—	—
Isophorone <sup>c</sup>	78-59-1	10	330	10,000	—	—	—	—
2-Methylnaphthalene	91-57-6	10	330	10,000	—	—	—	—
2-Methylphenol	95-48-7	10	330	10,000	—	—	—	—
4-Methylphenol	106-44-5	10	330	10,000	—	—	—	—
N-nitroso-di-n-propylamine <sup>c,d</sup>	621-64-7	10	330	10,000	41–116	38	41–126	38
N-nitrosodiphenylamine <sup>c</sup>	86-30-6	10	330	10,000	—	—	—	—
Naphthalene <sup>c,d</sup>	91-20-3	10	330	10,000	—	—	—	—
2-Nitroaniline <sup>c,d</sup>	88-74-4	25	830	25,000	—	—	—	—
3-Nitroaniline	99-09-2	25	830	25,000	—	—	—	—
4-Nitroaniline	100-01-6	25	830	25,000	—	—	—	—
Nitrobenzene <sup>c</sup>	98-95-3	10	330	10,000	—	—	—	—
2-Nitrophenol	88-75-5	10	330	10,000	—	—	—	—
4-Nitrophenol	100-02-7	25	830	25,000	10–80	50	11–114	50
2,2'-Oxybis(1-chloropropane) <sup>c</sup>	108-60-1	10	330	10,000	—	—	—	—
Pentachlorophenol <sup>b,c,d</sup>	87-86-5	25	830	25,000	9–103	50	17–109	47
Phenanthrene	85-01-8	10	330	10,000	—	—	—	—

Table 1-3. (continued).

Compound	CAS Number	CRQL <sup>a</sup>			QC Limits			
		Water (µg/L)	Low Soil (µg/kg)	Med. Soil (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Phenol	108-95-2	10	330	10,000	12–110	42	26–90	35
Pyrene	129-00-0	10	330	10,000	26–127	31	35–142	36
1,2,4-Trichlorobenzene <sup>b, c</sup>	120-82-1	10	330	10,000	39–98	28	38–107	23
2,4,5-Trichlorophenol	95-95-4	25	830	25,000	—	—	—	—
2,4,6-Trichlorophenol <sup>c</sup>	88-06-2	10	330	10,000	—	—	—	—

a. The term “medium soil” refers to contaminant concentrations in the soil. The CLP method includes a preanalysis screening protocol where samples screened with semivolatile organic analytes at >10,000 µg/kg are analyzed using the medium-level protocol. The medium-level protocol has an elevated CRQL, as indicated on the table. Information known about samples that will be close to, or exceed, the 10,000-µg/kg level should be provided to the SAM Program during laboratory acquisition and to the laboratory on chain-of-custody forms sent with the samples.

b. This compound is regulated under the National Primary Drinking Water Regulations and one-tenth of the MCL is less than the listed CRQL for water samples. When MCLs are a project applicable or relevant and appropriate requirement, the CLP method should not be used for water samples. When lower detection limits are required for water samples, they must be analyzed using an appropriate EPA method (e.g., Method 525.2).

c. The water sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for tap water as specified in the EPA Region IX PRGs. When lower detection limits are required for water samples, they must be analyzed using an appropriate EPA method (e.g., Method 525.2).

d. The low soil sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for residential soil, as specified in the EPA Region IX PRGs. When lower detection limits are required for soil samples, contact SAM personnel to discuss alternative methods.

e. The CLP identifies it as a volatile compound; it may be analyzed as a semivolatile compound. The CLP CRQLs are 10 µg/kg for low soil and 1,300 µg/kg for medium soil.

CAS = Chemical Abstract Service

CLP = Contract Laboratory Program

CRQL = contract-required quantification limit

EPA = U.S. Environmental Protection Agency

MCL = maximum contaminant level

PRG = preliminary remediation goal

QC = quality control

RPD = relative percent difference

SAM = Sample and Analysis Management

Table 1-4. Contract Laboratory Program pesticide organic-target-compound list.

Compound	CAS Number	CRQL		QC Limits			
		Water (µg/L)	Soil (µg/kg)	Water %R	Water RPD	Soil %R	Soil RPD
Aldrin <sup>b</sup>	309-00-2	0.05	1.7	40–120	22	34–132	43
Alpha-BHC <sup>b</sup>	319-84-6	0.05	1.7	—	—	—	—
Alpha-chlordane <sup>b</sup>	5103-71-9	0.05	1.7	—	—	—	—
Aroclor-1016 <sup>a</sup>	12674-11-2	1.0	33.0	—	—	—	—
Aroclor-1221 <sup>a</sup>	11104-28-2	2.0	67.0	—	—	—	—
Aroclor-1232 <sup>a</sup>	11141-16-5	1.0	33.0	—	—	—	—
Aroclor-1242 <sup>a</sup>	53469-21-6	1.0	33.0	—	—	—	—
Aroclor-1248 <sup>a</sup>	12672-29-6	1.0	33.0	—	—	—	—
Aroclor-1254 <sup>a</sup>	11097-69-1	1.0	33.0	—	—	—	—
Aroclor-1260 <sup>a</sup>	11096-82-5	1.0	33.0	—	—	—	—
Beta-BHC <sup>b</sup>	319-85-7	0.05	1.7	—	—	—	—
4,4'-DDD <sup>b</sup>	72-54-8	0.10	3.3	—	—	—	—
4,4'-DDE <sup>b</sup>	72-55-9	0.10	3.3	—	—	—	—
4,4'-DDT <sup>b</sup>	50-29-3	0.10	3.3	38–127	27	23–134	50
Delta-BHC	319-86-8	0.05	1.7	—	—	—	—
Dieldrin <sup>b,c</sup>	60-57-1	0.10	3.3	52–126	18	31–134	38
Endosulfan I	959-98-8	0.05	1.7	—	—	—	—
Endosulfan II	33213-65-9	0.10	3.3	—	—	—	—
Endosulfan sulfate	1031-07-8	0.10	3.3	—	—	—	—
Endrin	72-20-8	0.10	3.3	56–121	21	42–139	45
Endrin aldehyde	7421-36-3	0.10	3.3	—	—	—	—
Endrin ketone	53494-70-5	0.10	3.3	—	—	—	—
Gamma-BHC (Lindane) <sup>a,b</sup>	58-89-9	0.05	1.7	56–123	15	46–127	50
Gamma-chlordane <sup>b</sup>	5103-74-2	0.05	1.7	—	—	—	—
Heptachlor <sup>a,b</sup>	76-44-8	0.05	1.7	40–131	20	35–130	31
Heptachlor epoxide <sup>a,b</sup>	1024-57-3	0.05	1.7	—	—	—	—
Methyloxychlor <sup>b,c</sup>	72-43-5	0.50	17.0	—	—	—	—
Toxaphene <sup>a,b,c</sup>	8001-35-2	5.0	170.0	—	—	—	—

a. This compound is regulated under the National Primary Drinking Water Regulations and one-tenth of the MCL is less than the listed CRQL for water samples. When MCLs are a project applicable or relevant and appropriate requirement, the CLP method should not be used for water samples. When lower detection limits are required for water samples, they must be analyzed using an appropriate EPA method (e.g., Method 508 or 525.2).

b. The water sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for tap water, as specified in the EPA Region IX PRGs. When lower detection limits are required for water samples, they must be analyzed using an appropriate EPA method (e.g., Method 508 or 525.2).

c. The soil sample CRQL listed for this compound is greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for residential soil, as specified in the EPA Region IX PRGs. When lower detection limits are required for soil samples, contact SAM personnel to discuss alternative methods.

CAS = Chemical Abstract Service

CLP = Contract Laboratory Program

CRQL = contract-required quantification limit

EPA = U.S. Environmental Protection Agency

MCL = maximum contaminant level

PRG = preliminary remediation goal

QC = quality control

RPD = relative percent difference

SAM = Sample and Analysis Management



Table 1-5. Recommended minimum field quality control samples.<sup>a, b, c, d, e</sup>

Sample Type	Purpose	Collection	Documentation
Duplicate	Collocated sample is collected to evaluate total measurement precision (cumulative precision error associated with field and laboratory operations).	<b>Water and Soil:</b> Duplicates collected at a minimum frequency of 1/20 environmental samples or 1/day/matrix, whichever is less.	Assign separate sample number.
Field blank	Analyte-free water that is poured into a sample container at the sample collection site to check cross-contamination during sample collection and shipment. <sup>c</sup>	<p><b>Water:</b></p> <p><b>VOCs:</b> The recommended minimum frequency is 1/20 environmental samples or 1/day, whichever is less.</p> <p><b>Metals:</b> The recommended minimum frequency is 1/20 environmental samples or 1/day, whichever is less.</p> <p><b>Radionuclides:</b> If sampling under windy conditions, the recommended minimum frequency is 1/20 environmental samples or 1/day, whichever is less.</p> <p><b>Soil:</b> Field blanks are only recommended for subsurface soil (&gt;6 in.) collected for radionuclide analyses. The recommended minimum frequency is 1/20 environmental samples or 1/day, whichever is less. A field blank should be analyzed for the same radiological constituents as the environmental sample.</p>	Assign separate sample number.
Trip blank	Organic-free water in a vial sent from the laboratory to accompany VOC water samples during sampling and shipment processes. This blank is used for checking for cross-contamination during sample handling, shipment, and storage. <sup>d</sup>	<p><b>Soil:</b> Trip blanks are not recommended.</p> <p><b>Water:</b> Trip blanks are only recommended for VOCs. The recommended minimum frequency is 1/VOC cooler. To minimize the number of trip blanks, every effort should be made to include all VOC samples in one cooler and to minimize the number of VOC collection days.</p>	Assign separate sample number.
Equipment rinse blank	Sample is obtained by rinsing sample collection equipment with analyte-free water, <sup>d</sup> following decontamination, to evaluate field decontamination procedures.	Equipment blanks should be collected from the same equipment used to collect samples, and they should be analyzed for the same constituents. Equipment blanks are not required if dedicated or disposable equipment is used. The recommended minimum frequency is 1/day/matrix or 1/20 environmental samples, whichever is less.	Assign separate sample number.

a. The frequencies specified in this table are a recommended minimum. Consensus agreement among FFA/CO WAG managers before submittal of the SAP can be used to adjust collection frequencies (increase or decrease). Adjustment must be justified in the SAP.

b. Source: *A Compendium of Superfund Field Operations Methods* (EPA 1987b)

c. Source: *Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA 1993a)

d. The water used for these blanks should be VOC analyte-free and can be obtained from a laboratory familiar with VOC analysis requirements. The SAM Program can arrange to supply the water if given 2 weeks notice before sampling.

e. No field QC samples are required for other sample matrices (e.g., gas, waste, and biota).

EPA = U.S. Environmental Protection Agency

FFA/CO = Federal Facility Agreement and Consent Order

QC = quality control

SAM = Sample and Analysis Management

SAP = sampling and analysis plan

VOC = volatile organic compound

WAG = waste area group

The PE samples submitted for inorganic, miscellaneous classical, and/or organic parameters are assessed as described in PLN-862, “Performance Evaluation Sample Program Plan,” or in accordance with project specifications included in the FSP.

**1.4.5.2.2 Field Accuracy**—Sources of field inaccuracy are sampling preservation and handling, field contamination, and the sample matrix. The sampling locations and methods described in the project-specific FSP or test plan and Sections 2.1, 2.2, and 2.3 of this QAPjP are designed to be representative of the media being sampled or focused on specific scientific objectives. Sampling accuracy can be assessed by evaluating the results of field, equipment rinsate, and/or trip blanks, as described in Section 4.3. During the sampling for VOCs, some portion of the volatile components might be lost. Although EPA-approved methods will be used to minimize the loss (EPA 1991b, pages 1–22), there is no easy way to measure that loss.

Contamination of the samples in the field or during shipment, by sources other than the contamination under investigation, would yield inaccurate results. Therefore, equipment, field, and/or trip blanks will be sent to the chemical and radiological laboratories for analysis to evaluate possible contamination. Recommendations for blanks are listed in Table 1-5. Project-specific types and numbers of equipment, field, and/or trip blanks will be identified in the site-specific FSP or test plan.

**1.4.5.3 Completeness.** Completeness is a measure of the number of samples collected and analyzed, expressed as a percentage of the number of samples planned to be collected and analyzed. Field sampling completeness is affected by such factors as equipment and instrument malfunctions and insufficient sample recovery. Analytical completeness is affected if a sample is not analyzed before its holding time expires; if a sample is damaged during handling, shipping, unpacking, or storage; or if the laboratory data cannot be validated and the sample cannot be reanalyzed. The completeness goal for sampling activities is 90% for noncritical samples and 100% for critical samples. Critical samples are those samples required to achieve project objectives or limits on decision errors. Noncritical samples are for informational purposes only or are needed to provide background information (EPA 1998a).

**1.4.5.4 Representativeness.** Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population parameter at a sampling point or for a process condition or environmental condition (EPA 1998a, page D-2). Representativeness, which is a qualitative term, should be evaluated to determine whether in situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomena measured or studied. The representativeness criterion is best satisfied by confirming that sampling locations are selected properly and a sufficient number of samples are collected to meet the confidence level required by the intended use of the data. Sampling locations will be documented in the project-specific FSP or test plan. In some cases, a nonstatistical approach will be used to collect samples, or nonrepresentative samples will be taken to meet specific scientific objectives, which will be documented in the project-specific FSP or test plan.

**1.4.5.5 Comparability.** Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent concerning the measurement of a specific variable or groups of variables. In a laboratory analysis, the term *comparability* focuses on method type comparison, holding times, stability issues, and aspects of overall analytical quantitation.

A number of issues can make two data sets comparable, and the presence of each of the following items enhances their comparability:

- Two data sets should contain the same set of variables of interest

- Units in which these variables were measured should be convertible to a common metric
- Similar analytical procedures and QA should be used to collect data for both data sets
- Time of measurements of certain characteristics (variables) should be similar for both data sets
- Measuring devices used for both data sets should have approximately similar detection levels
- Rules for excluding certain types of observations from both samples should be similar
- Samples within data sets should be selected in a similar manner
- Sampling frames from which the samples were selected should be similar
- The number of observations in both data sets should be of the same order or magnitude.

These characteristics vary in importance, depending on the final use of the data. The closer two data sets are with regard to these characteristics, the more appropriate it will be to compare them. Large differences between characteristics may be of only minor importance, depending on the decision that is to be made from the data.

Comparability is very important when conducting meta-analysis, which combines the results of numerous studies to identify commonalities that are then hypothesized to hold over a range of experimental conditions. Meta-analysis can be very misleading if the studies being evaluated are not truly comparable. Without proper consideration of comparability, the findings of the meta-analysis might be due to an artifact of methodological differences among the studies rather than due to differences in experimentally controlled conditions. The use of expert opinion to classify the importance of differences in characteristics among data sets is invaluable (EPA 1998a, page D-3).

**1.4.5.6 Sensitivity.** Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. As required through the analytical contracts and where applicable in approved methods, determinations are made to determine minimum concentrations that can be measured by a method as the method detection limit, or by an instrument as the instrument detection limit, or by a laboratory as a practical concentration limit. Method detection limit (MDL) must be determined, at a minimum, annually for all chemical measurements and must be submitted to the Contractor upon request. Instrument detection limit is defined as the lowest value that a specific instrument can discern a real signal from instrument noise and is an evaluation of the maximum sensitivity of an analytical instrument to perform an analysis as referenced from the CLP-ILM 3.0. The practical quantitation limit is defined as the lowest concentration where the 95% confidence interval is within 20% of the true concentration of the sample. The percent uncertainty at the 95% confidence level shall not exceed 20% of the results for concentrations greater than the practical quantitation limit.

## **1.4.6 Measurement Performance Criteria**

While the quality objectives state data user needs, they do not provide sufficient information about how these needs can be satisfied. One of the most important features of the QAPjP is that it links the data user's quality objectives to verifiable measurement performance criteria.

**1.4.6.1 Contract Laboratory Program and Idaho Completion Project Targets.** Tables 1-2, 1-3, 1-4, and 1-6 through 1-11 contain EPA CLP target analyte lists (TALs), ICP target radionuclide lists, toxicity characteristic leaching procedure (TCLP) TALs, and miscellaneous analytes and test methods. These tables define the TALs that are either typically used or commonly available through laboratory

subcontracts placed by the SAM Program. The required detection or quantification limits listed are those found in ER-SOW-394. If different target analytes, analytical methods, or detection limits are required by a project, then the specific requirements will be called out in FSPs, work plans, or other project planning documents.

Table 1-5 contains minimum requirements for collecting field QC samples. The requirements are based on the latest EPA guidance (EPA 1987a, page 12; Harris 1990, Section 6.1, pages 2–4) with some exceptions agreed to in a conference among the NE-ID, EPA Region 10, and IDEQ. For sampling activities involving only soil, trip blanks are not recommended.

For cases in which more or less stringent field QC requirements than those recommended in Table 1-5 are determined necessary, the rationale and requirements will be specified in the project-specific FSP or test plan.

**1.4.6.2 Detection Limits.** Detection limits must not exceed one-tenth the risk-based or decision-based concentrations for the contaminants of concern. The one-tenth value is used to ensure that contaminants of interest can be accurately quantified at the decision level. The detection limits listed in this QAPjP are published CRQLs for CLP organics (EPA 1999, pages C-3 through C-8) or contract-required detection limits (CRDLs) for CLP inorganics (EPA 1993b, pages C-1 and C-2); estimated quantitation limits (EQLs) for TCLP volatile or semivolatile organics, or required quantitation limits for TCLP metals, or EQLs or MDLs for pesticides, herbicides, and miscellaneous analytes (EPA 1986); and CRDLs as defined in ER-SOW-394. The tables in this QAPjP must be consulted when determining methods that will meet the project DQOs. If special analytical methods are required to meet acceptable detection levels, then SAM personnel must be informed of this when requesting analytical services for the project.

Some groundwater samples will be analyzed for VOCs using EPA Method 524.2 (EPA 1992) or SW-846 Method 8260B (EPA 1986) using a 25-mL sample volume, because the CLP detection limits are too high for evaluating the groundwater ingestion pathway in a risk assessment.<sup>d</sup> If required detection limits for any analyses are lower or higher than those listed in the Master Task Agreement SOWs, then those detection limits will be described in the project-specific FSP, test plan, and the laboratory TOS. Detection and/or quantitation limits are shown in Tables 1-2, 1-3, 1-4, and 1-6 through 1-11.

---

d. Cirone, P., EPA, to Superfund Remediation Project Managers, July 6, 1990, "Detection Limits for Human Health Risk Assessments."

Table 1-6. Required detection limits for inorganic analyses (metals, wet chemical, and miscellaneous methods).

CERCLA Metals and RCRA Metals, Excluding TCLP and Universal Treatment Standard					SDWA and NPDES Metals		TCLP Metals		SDWA and NPDES Miscellaneous	
Universal Treatment Standard Metals										
Analyte	RDL <sup>a</sup> (µg/L)	Analyte	Wastewater RDL <sup>a</sup> (µg/L)	Nonwastewater RDL <sup>a</sup> (µg/L TCLP)	Analyte	RDL <sup>a</sup> (µg/L)	Analyte	RDL <sup>a</sup> (µg/L)	Analyte	RDL <sup>a</sup> (mg/L)
Aluminum	200	Antimony	90	50	Aluminum	10	Arsenic	250	Chloride	50
Antimony	60	Arsenic	70	250	Antimony	1.2	Barium	1,000	Fluoride	0.4
Arsenic	10	Barium	60	1,000	Arsenic	10	Cadmium	50	Nitrate-N	2
Barium	200	Beryllium	40	60	Barium	200	Chromium	250	Nitrate-nitrite-N	2
Beryllium	5	Cadmium	30	5	Beryllium	0.8	Lead	250	Nitrite-N	0.2
Cadmium	5	Chromium	100	30	Cadmium	1.0	Mercury	2	Phenols	0.001
Calcium	5,000	Lead	30	30	Calcium	250	Selenium	50	Sulfate	50
Chromium	10	Mercury	5	1	Chromium	10	Silver	250	Sulfide	0.01
Cobalt	50	Nickel	150	550	Copper	25			Surfactants	0.1
Copper	25	Selenium	40	250	Iron	60			Total dissolved solids	100
Iron	100	Silver	20	5	Lead	3.0				
Lead	3	Thallium	70	10	Magnesium	250				
Magnesium	5,000	Vanadium	200	80	Manganese	10				
Manganese	15	Zinc	100	200	Mercury	0.2				
Mercury	0.2				Nickel	20				
Nickel	40				Potassium	250				
Potassium	5,000				Selenium	5.0				
Selenium	5				Silver	10				
Silver	10				Sodium	250				
Sodium	5,000				Thallium	0.4				
Thallium	10				Zinc	20				
Vanadium	50									
Zinc	20									

a. The RDLs are specified on a weight-to-volume basis (e.g., µg/L). For nonaqueous samples, specified RDLs apply to the neat solution (digestate, distillate, extractant) from the applicable sample preparation methods.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

NPDES = National Pollutant Discharge Elimination System

RCRA = Resource Conservation and Recovery Act

RDL = required detection limit

SDWA = Safe Drinking Water Act

TCLP = toxicity characteristic leaching procedure

Table 1-7. Radionuclide analysis list for the Idaho Completion Project.<sup>a</sup>

Radionuclides <sup>b</sup>	Contract-Required Detection Limits <sup>c</sup>	
	Soil (pCi/g)	Water (pCi/L)
<u>Alpha spectrometry</u>		
Americium (Am-241)	0.05	0.2*
Curium (Cm-242, Cm-244)	0.05	0.2
Neptunium (Np-237)	0.05*	0.2*
Plutonium (Pu-238, Pu-239/240, and Pu-242)	0.05	0.2*
Thorium (Th-228, Th-230, and Th-232)	0.05	0.5*
Uranium (U-234, U-235, and U-238)	0.05*	0.5*
<u>Gamma spectrometry<sup>d</sup></u>		
Antimony (Sb-125)	~0.1	~30
Cerium (Ce-144)	~0.1	~30
Cesium (Cs-134 and Cs-137)	0.1 <sup>d*</sup>	30 <sup>d*</sup>
Cobalt (Co-60)	~0.1	~30
Europium (Eu-152, Eu-154, and Eu-155)	~0.1	~30
Manganese (Mn-54)	~0.1	~30
Ruthenium (Ru-106)	~0.1	~30
Silver (Ag-108m and Ag-110m)	~0.1*	~30*
Zinc (Zn-65)	~0.1	~30
Other <sup>e</sup> (Results >2 $\sigma$ and >MDA) <sup>e</sup>	~0.1	~30
<u>Specific analyses</u>		
Carbon (C-14)	3	3
Iodine (I-129)	1*	1*
Iron (Fe-55)	5	5
Nickel (Ni-59)	5	5
Nickel (Ni-63)	5	5
Plutonium (Pu-241)	1	10*
Radium (Ra-226) <sup>f</sup>	0.5*	1*
Radium (Ra-228)	0.5	1
Strontium (Sr-89)	0.5	1

Table 1-7. (continued).

Radionuclides <sup>b</sup>	Contract-Required Detection Limits <sup>c</sup>	
	Soil (pCi/g)	Water (pCi/L)
Strontium (Sr-90)	0.5	1
Strontium (Sr-89 and Sr-90) total	0.5	1
Technetium (Tc-99)	1	10*
Tritium (H-3)	20	400
<u>Indicator analyses</u>		
Gross alpha (gross $\alpha$ )	10	4
Gross beta (gross $\beta$ )	10	4

a. This analysis (target) list does not imply that the analysis must include all radionuclides on this table.

b. The analysis might include radionuclides not on this table (contact the SAM Program).

c. All listed CRDLs are sufficiently low to meet most sample analysis needs. They are 10 times lower than all  $10^{-4}$  and most  $10^{-6}$  residential 100-year risk-based limits. The CRDLs are based on ideal sample and analysis conditions. Actual detection limits achieved by the laboratory may vary, depending on the radionuclide concentrations, sample matrix, sample size, counting times, and detection system.

d. The contract-required detection limit applied to all gamma-emitting radionuclides is based on Cs-137. The detection limits of other gamma radionuclides will differ from that of Cs-137 (i.e., 0.1 pCi/g and 30 pCi/L); however, they are commensurate with that for Cs-137, taking into account differences in gamma-ray energies and branching ratios (gamma emission probabilities).

e. Naturally occurring radionuclides are not reported unless the measured concentrations are notably greater than what would normally be expected for the particular sample matrix.

f. A separate, specific analysis is required for Ra-226, which is not included in the standard INEEL target analyte list for gamma-emitting radionuclides. Contact the SAM Program if clarification or additional information is needed.

\* The CRDLs shown with an asterisk (\*) are higher than one-tenth of the  $10^{-6}$  risk-based limits (i.e., they are not 10 times lower than an activity that corresponds to the  $10^{-6}$  risk-based limit) and thus may not meet project/program requirements for making  $10^{-6}$  risk-based decisions. See footnote c above. The option to request lower CRDLs is possible for some radionuclides (contact the SAM Program). See further discussion in Section 1.4.6.2 of this QAPjP.

CRDL = contract-required detection limit

INEEL = Idaho National Engineering and Environmental Laboratory

MDA = minimum detectable activity

QAPjP = quality assurance project plan

SAM = Sample and Analysis Management

Table 1-8. U.S. Environmental Protection Agency Drinking Water Method 524.2 target analyte list.

Compound <sup>a</sup>	CAS Number	Method Detection Limits <sup>b</sup> (µg/L)	
		Wide Bore Column	Narrow Bore Column
Acetone	67-64-1	0.28	ND
Acrylonitrile	107-13-1	0.22	ND
Allyl chloride	107-05-1	0.13	ND
Benzene	71-43-2	0.04	0.03
Bromobenzene	108-86-1	0.03	0.11
Bromochloromethane	74-97-5	0.04	0.07
Bromodichloromethane <sup>d</sup>	75-27-4	0.08	0.03
Bromoform	75-25-2	0.12	0.20
Bromomethane	74-83-9	0.11	0.06
2-Butanone	78-93-3	0.48	ND
Carbon disulfide	75-15-0	0.093	ND
Carbon tetrachloride <sup>d</sup>	56-23-5	0.21	0.08
Chloroacetonitrile	107-14-2	0.12	ND
Chlorobenzene	108-90-7	0.04	0.03
1-Chlorobutane	109-69-3	0.18	ND
Chloroethane	75-00-3	0.10	0.02
Chloromethane	74-87-3	0.13	0.05
Chloroform <sup>d</sup>	67-66-3	0.03	0.02
2-Chlorotoluene	95-49-8	0.04	0.05
4-Chlorotoluene	106-43-4	0.06	0.05
Cis-1,2-dichloroethene	156-94-2	0.12	0.06
Cis-1,3-dichloropropene <sup>d</sup>	10061-01-5	ND	ND
Dibromochloromethane	124-48-1	0.05	0.07
Dibromomethane	74-95-3	0.24	0.03
1,2-Dibromoethane <sup>c,c</sup>	106-93-4	0.06	0.02
1,2-Dibromo-3-chloropropane <sup>c,c</sup>	96-12-8	0.26	0.05
1,2-Dichlorobenzene	95-50-1	0.03	0.05
1,3-Dichlorobenzene	541-73-1	0.12	0.05
1,4-Dichlorobenzene <sup>d</sup>	106-46-7	0.03	0.04
Dichlorodifluoromethane	75-71-8	0.10	0.11
1,1-Dichloroethane	75-34-3	0.04	0.03
1,2-Dichloroethane <sup>d</sup>	107-06-2	0.06	0.02



Table 1-8. (continued).

Compound <sup>a</sup>	CAS Number	Method Detection Limits <sup>b</sup> (µg/L)	
		Wide Bore Column	Narrow Bore Column
1,1-Dichloroethene <sup>c</sup>	75-35-4	0.12	0.05
1,2-Dichloropropane <sup>c</sup>	78-87-5	0.04	0.02
1,3-Dichloropropane	142-28-9	0.04	0.04
2,2-Dichloropropane	590-20-7	0.35	0.05
1,1-Dichloropropene	563-58-6	0.10	0.02
1,1-Dichloropropanone	513-88-2	1.0	ND
Diethyl ether	60-29-7	0.28	ND
Ethylbenzene	100-41-4	0.06	0.03
Ethyl methacrylate	97-63-2	0.028	ND
Hexachlorobutadiene <sup>d</sup>	87-68-3	0.11	0.04
Hexachloroethane	67-72-1	0.057	ND
2-Hexanone	591-78-6	0.39	ND
Isopropylbenzene	98-82-8	0.15	0.10
4-Isopropyltoluene	99-87-6	0.12	0.26
Methacrylonitrile	126-98-7	0.12	ND
Methylacrylate	96-33-3	0.45	ND
Methylene chloride	75-04-2	0.03	0.09
Methyl iodide	74-88-4	0.019	ND
Methylmethacrylate	80-62-6	0.43	ND
4-Methyl-2-pentanone	108-10-1	0.17	ND
Methyl-t-butyl ether	1634-04-4	0.09	ND
N-butylbenzene	104-51-8	0.11	0.03
N-propylbenzene	103-65-1	0.04	0.06
Naphthalene	91-20-3	0.04	0.04
Nitrobenzene <sup>c</sup>	98-95-3	1.2	ND
2-Nitropropane	79-46-9	0.16	ND
Pentachloroethane	76-01-7	0.14	ND
Propionitrile	107-12-0	0.14	ND
Sec-butylbenzene	135-98-8	0.13	0.12
Styrene	100-42-5	0.04	0.06
Tert-butylbenzene	98-06-6	0.14	0.33
1,1,1,2-Tetrachloroethane	630-20-6	0.05	0.04
1,1,2,2-Tetrachloroethane <sup>d</sup>	79-34-5	0.04	0.20

Table 1-8. (continued).

Compound <sup>a</sup>	CAS Number	Method Detection Limits <sup>b</sup> (µg/L)	
		Wide Bore Column	Narrow Bore Column
Trans-1,2-dichloroethene	156-60-5	0.06	0.03
Trans-1,3,-dichloropropene <sup>c</sup>	10061-02-6	ND	ND
Trans-1,4-dichloro-2-butene <sup>c</sup>	110-57-6	0.36	ND
Tetrachloroethene	127-18-4	0.14	0.05
Tetrahydrofuran	109-99-9	1.6	ND
1,2,3-Trichlorobenzene	87-61-6	0.03	0.04
1,2,4-Trichlorobenzene	120-82-1	0.04	0.20
1,1,1-Trichloroethane	71-55-6	0.08	0.04
1,1,2-Trichloroethane <sup>d</sup>	79-00-5	0.10	0.03
Trichloroethene	79-01-6	0.19	0.02
Trichlorofluoromethane	75-69-4	0.08	0.07
1,2,3-Trichloropropane <sup>c</sup>	96-18-4	0.32	0.03
1,2,4-Trimethylbenzene	95-63-6	0.13	0.04
1,3,5-Trimethylbenzene	108-67-8	0.05	0.02
Toluene	108-88-3	0.11	0.08
Vinyl chloride <sup>c</sup>	75-01-4	0.17	0.04
o-Xylene	95-47-6	0.11	0.06
m-Xylene	108-38-3	0.05	0.03
p-Xylene	106-42-3	0.13	0.06

a. This is the list of compounds for which EPA Method 524.2 is approved. The specific analytes to be determined using that method will be specified by ER-SOW-394 or by the project when requesting the SAM Program to prepare task order SOWs.

b. When no matrix effects are present, these MDLs also are achievable using EPA Method 8260B and a 25-m sample volume.

c. This compound is regulated under the National Primary Drinking Water Regulations and one-tenth of the MCL is less than the listed MDLs. One of the two listed MDLs is less than the relevant MCL for this compound. When MCLs are a project applicable or relevant and appropriate requirement, specifying the requirements for the analytical column to use will be necessary when requesting the SAM Program to obtain the analytical services.

d. The MDLs listed for this compound are greater than one-tenth of the 10<sup>-6</sup> risk-based screening level for tap water, as specified in the EPA Region IX PRGs. At least one of the two MDLs listed is less than the 10<sup>-6</sup> risk-based screening level for tap water.

e. The MDLs listed for this compound are greater (in some cases, much greater) than the one-tenth of the 10<sup>-6</sup> risk-based screening level for tap water. If this compound is a contaminant of concern, then negotiations concerning an acceptable risk to which it should be evaluated and the potential need to use alternative and costly analytical methods must be discussed during project planning.

CAS = Chemical Abstract Service

EPA = U.S. Environmental Protection Agency

MCL = maximum contaminant level

MDL = method detection limit

PRG = preliminary remediation goal

SAM = Sample and Analysis Management

SOW = statement of work

Table 1-9. Toxicity characteristic leaching procedure volatile organic target compound list.<sup>a</sup>

Compound	CAS Number	EQLs <sup>a</sup> (µg/L)
Benzene <sup>b</sup>	71-43-2	25
Carbon tetrachloride	56-23-5	25
Chlorobenzene <sup>b</sup>	108-90-7	25
Chloroform	67-66-3	25
1,2-Dichloroethane	107-06-2	25
1,1-Dichloroethylene <sup>b</sup>	75-35-9	25
Methyl ethyl ketone (2-butanone)	78-93-3	100
Tetrachloroethylene	127-18-4	25
Trichloroethylene <sup>b</sup>	79-01-6	25
Vinyl chloride	75-01-4	20

a. SW-846 Method 8260B (EPA 1986). The EQLs listed are for aqueous samples. The EQLs are highly matrix-dependent and might not always be achievable.

b. Precision and accuracy criteria regarding matrix spike/matrix spike duplicate for these compounds are the same as those specified in Table 1-2.

CAS = Chemical Abstract Service

EPA = U.S. Environmental Protection Agency

EQL = estimated quantitation limit

Table 1-10. Toxicity characteristic leaching procedure semivolatile organic target compound list.<sup>a,b</sup>

Compound	CAS Number	EQLs (µg/L)
2-Methylphenol(o-cresol)	95-48-7	50
3-Methylphenol(m-cresol)	108-39-4	50
4-Methylphenol(p-cresol)	106-44-5	50
Total cresol	—	50
1,4-Dichlorobenzene <sup>c</sup>	106-46-7	50
2,4-Dinitrotoluene <sup>c</sup>	121-14-2	13
Hexachlorobenzene	118-74-1	13
Hexachlorobutadiene	87-68-3	50
Hexachloroethane	67-72-1	50
Nitrobenzene	75-01-4	50
Pentachlorophenol <sup>c</sup>	87-86-5	250
Pyridine	110-86-1	50
2,4,5-Trichlorophenol	95-95-4	250
2,4,6-Trichlorophenol	88-06-2	50

a. SW-846 Method 8270C (EPA 1986). The EQLs listed are for aqueous samples. The EQLs are highly matrix-dependent and may not always be achievable.

b. For waste characterization activities to characterize waste to meet the Envirocare waste acceptance criteria, the methods recognized by the State of Utah Bureau of Laboratory Improvement Environmental Laboratory Certification Program will be used. The MDLs may vary when these older methods are used.

c. Precision and accuracy criteria regarding matrix spike/matrix spike duplicate for these compounds are the same as those specified in Table 1-3.

CAS = Chemical Abstract Service

EPA = U.S. Environmental Protection Agency

EQL = estimated quantitation limit

MDL = method detection limit

Table 1-11. Toxicity characteristic leaching procedure pesticides/herbicides target compound list.

Pesticides/Herbicides	CAS Number	Method 8081A <sup>c</sup> MDL (µg/L)	Methods 8151A <sup>c</sup> MDL (µg/L)	TCLP EQLs (µg/L)
Chlordane <sup>a</sup>	57-74-9	NA <sup>d</sup>	NA	3.0
2,4-D <sup>b</sup>	94-75-7	NA	0.2	1,000
Endrin <sup>a</sup>	72-20-8	0.82	NA	2.0
Heptachlor <sup>a</sup>	76-44-8	0.56	NA	0.8
Heptachlor epoxide	1024-57-3	0.34	NA	0.8
Lindane <sup>a</sup>	58-89-9	0.32	NA	40
Methoxychlor <sup>a</sup>	72-43-5	NA	NA	1,000
Toxaphene <sup>a</sup>	8001-35-2	NA	NA	50
2,4,5-TP(silvex) <sup>b</sup>	93-72-1	NA	0.075	100

a. SW-846 Method 8081A (EPA 1986)

b. SW-846 Method 8151A (EPA 1986)

c. For waste characterization activities to characterize waste to meet the Envirocare waste acceptance criteria, the methods recognized by the State of Utah Bureau of Laboratory Improvement Environmental Laboratory Certification Program will be used. The MDLs may vary when these older methods are used.

d. NA = Data are not available.

CAS = Chemical Abstract Service

EPA = U.S. Environmental Protection Agency

EQL = estimated quantitation limit

MDL = method detection limit

TCLP = toxicity characteristic leaching procedure

## 1.5 Special Training Requirements/Certifications

The purpose of this section is to ensure that any specialized training requirements necessary to complete the projects are known and furnished and the procedures are described in sufficient detail to ensure that specific training skills can be verified, documented, and updated as necessary.

### 1.5.1 Training

General training requirements for work at CERCLA/RCRA cleanup sites are listed below:

- Site-specific HASP training, 40-hour Occupational Safety and Health Administration Hazardous Waste Operator (HAZWOPER) training for project employees (24 hours of field supervised training), 24-hour Occupational Safety and Health Administration HAZWOPER training for nonproject employees (8 hours of field supervised training)
- Lead abatement certification, as required.
- Radiation Worker I or II (for radiologically contaminated sites only)
- Hazard Communications training
- Hearing Conservation Program training, as required

- Site-Specific Hazards Awareness training
- Daily Job Briefings (Plan-of-the-Day meetings)
- Nonroutine Field Sampling Techniques
- Hazardous Material Awareness training (shipping requirements).

Not all of the above training is required for each project. Additional training may be required by some projects. The project-specific HASP defines the specific training required for the project.

### **1.5.2 Certification**

The following are certification requirements:

- Asbestos abatement certification, as required
- Medical surveillance determination and certification as fit for duty, determined by Industrial Hygiene exposure assessment
- Safe work permit and radiological work permit requirements.

Site-specific training requirements are listed in the individual project-specific HASPs. All certifications or documentation representing completion of specialized training are maintained in training files.

## **1.6 Documentation and Records**

All documents used to perform work by or for ICP are controlled documents. Controlled documents are reviewed by specific technical and compliance professionals and are approved as specified in the FFA/CO (DOE-ID 1991a). Changes to controlled documents are completed by initiating a Document Action Request (Form 412.11) and obtaining reviews and approval by the same organizations that approved the original document.

A thorough, systematic, and qualitative audit of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management and reporting, and waste management practices is completed before a laboratory is awarded a subcontract to analyze samples for the SAM Program. The Procurement organization retains the record of that audit, corrective actions, responses, and closure.

### **1.6.1 Field Operation Records**

All project records are retained as specified in the FFA/CO, Section XX, “Retention of Records and Administrative Record” (DOE-ID 1991a). Those records are scanned into an OIS and retained as permanent records or as instructed by the EPA and IDEQ. Records are provided to the records coordinators by the project managers for retention. The records are presently stored in the Technical Support Building on Foote Drive in Idaho Falls, Idaho. Examples of specific record types are described in the following subsections.

**1.6.1.1 Sample Logbook.** Field samplers are required to maintain a sample logbook during a sampling project. The sample logbooks are issued by the field data coordinator (FDC) and returned to the

FDC when the project is completed or the logbook is full. The FDC gives the logbooks to the records coordinator. The following information is recorded in the sample logbook:

- Sampling location.
- Depth or depth interval.
- Field personnel.
- Document numbers of standard and/or detailed operating procedures.
- Types and numbers of samples collected.
- Collection method, time, and date of sample collection.
- Type and preparation of sample bottles, preservation of samples.
- Field measurement data.
- Weather conditions.
- Ambient temperature.
- Barometric pressure.
- Any observations about conditions or incidents affecting sampling activities and/or sample quality.
- Preparation and submission of field QC samples, including frequency, preservation, standards traceability, and calibration of instruments used.
- Work/QA plan number.
- Any deviations from the characterization plan used for the project. (Changes to the characterization plans are made using a Document Action Request.)
- If deviations from the characterization plan are not made, routine information (such as sampling locations or standard operating procedures used) does not have to be explicitly stated in the narrative section of the logbook.
- Sign the “Recorded by” line immediately after concluding each sampling activity.

**1.6.1.2 Field Team Leader’s Daily Logbook.** The FTL maintains a daily logbook during a sampling/data collection activity to provide a daily record of events, observations, and measurements. The FDC controls the FTL daily logbook in the same manner as described for sample logbooks. This logbook may be combined with the sample logbook.

**1.6.1.3 Calibration Logbook.** Where required, a calibration logbook is maintained. The logbook includes all pertinent information about the piece of equipment, date of last calibration, serial number of equipment, when and where used, and calibration standard used. The FDC controls the logbook in the same manner as described for sample logbooks. Radiological control technicians maintain a use log for

survey instruments. The log is used to record time, method, results, and name of individual performing the survey.

**1.6.1.4 Sample-Shipping Logbook.** The FTL or designee is required to maintain the sample-shipping logbook to record information such as the date each sample is sent to a laboratory, name of the laboratory, and chain-of-custody number.

**1.6.1.5 Chain-of-Custody.** The FTL or designee is required to complete a chain-of-custody form for each sample or set of samples collected. A copy of the chain-of-custody is retained with the logbook. The original chain-of-custody form accompanies the samples to the laboratory, and it is returned with the sample results. The original chain-of-custody is retained as an ICP record.

**1.6.1.6 Corrective Action Reports.** Corrective action reports, if used, are provided to the records coordinator for retention as an ICP record.

**1.6.1.7 Field Procedures.** Field procedures are controlled documents maintained by the Document Control coordinator. The actual revisions of the procedures used are noted in the various field logbooks, and the revision is retrievable via the Document Control System.

**1.6.1.8 Quality Assurance Project Plan.** This QAPjP will be retained as a record. All previous versions of the QAPjP are available from the records coordinator and are stored on the Environmental Restoration Project Files (formerly called the OIS).

**1.6.1.9 Field Sampling Plans.** The FSPs are controlled documents and are available from the Document Control coordinator. Previous versions of the FSP, if revised, are retained by the Document Control coordinator and are stored on the Environmental Restoration Project Files.

**1.6.1.10 Remedial Design/Remedial Action Work Plan.** The RD/RA work plans are controlled documents controlled by the Document Control coordinator. If changes are made to the work plan, the previous version is retained and scanned into the Environmental Restoration Project Files.

## **1.6.2 Data Handling Records**

The requirements, responsibilities, and procedures for managing records within the Idaho Completion Project are described in Sections 1.6.3–1.6.5.

## **1.6.3 Laboratory Records**

Laboratory records include those maintained exclusively on-Site by the laboratories (internal laboratory records) and those required for submittal to the INEEL under the terms of the applicable master task agreements (external laboratory records). The types of records included in each category are described in the following subsections.

**1.6.3.1 Internal Laboratory Records.** Before a Blanket Master Contract (BMC) is awarded, cognizant INEEL and/or Environmental Management Consolidated Audit Program personnel perform an onsite audit at the laboratory's facilities. Most of the documentation reviewed (e.g., SOPs and associated logbooks) never leaves the premises. Once the BMC is awarded, laboratory personnel are required to initiate and maintain documentation for various laboratory activities associated with INEEL work. This documentation requirement may be met by using computerized storage and/or either hardbound or unbound logbooks. The requirement is that the system chosen shall allow for storage, easy audit review, and ready retrieval (chronologically sequenced in paginated, hard copy form) of all required information

throughout the duration of the BMC. Activities required to be documented include things such as laboratory equipment (e.g., balances and piston or plunger-operated volumetric pipettes) calibration checks, fume hood airflow checks, instrument service, standards tracking, reagent water monitoring, water purification system maintenance, sample receipt and internal tracking, pH verification, sample preparation, analysis runs, and data shipments. Although this documentation is maintained and stored onsite at the laboratory facility, laboratory personnel are contractually obligated to submit pertinent copies to the INEEL upon request.

**1.6.3.2 External Laboratory Records.** For any given INEEL project-specific sampling event in which analytical services are procured under a BMC, the resulting external laboratory records consist of one or more data packages, each containing data from 20 or less field samples processed under only one analytical discipline (i.e., inorganic, organic, or radiological). Each data package is formatted according to one of three distinct reporting levels. The reporting levels are Results Only, Standard, and Standard plus Raw Data. Standard plus Raw Data are comparable to an EPA CLP data package in that specified report forms, for recording all field sample and associated QC sample results, and a complete compilation of pertinent raw data are mandated. Raw data are not included with either a Results Only or Standard data package, and the reporting requirements are much less formal than those for Standard plus Raw Data. However, all raw data must be maintained as internal laboratory records so that any given Results Only or Standard data package can be upgraded to Standard plus Raw Data deliverables.

#### **1.6.4 Document Control**

External laboratory records are stored and managed in accordance with contractor procedures. The INEEL contractor maintains procedures that specify requirements for appropriately completing field logbooks, revising logbook data, and other logbook requirements. These requirements include the use of indelible and waterproof ink to make logbook entries, that corrections are made using a single line and are dated and initialed by the person making the change, and that completed logbooks are returned to the SAM field data coordinator for archiving. Record management requirements for completed logbooks and all sample analysis data also are found in PLN-476, "Document and Records Management Plan for the Balance of INEEL Cleanup Project."

#### **1.6.5 Data Reporting Package Archival and Retrieval**

The requirements for data reporting package archiving and retrieval are specified in PLN-476, "Document and Records Management Plan for the Balance of INEEL Cleanup Project." This plan requires permanent storage of essentially all environmental records. For data packages received from the sample analysis laboratories and the data validation reports produced using these data, the SAM organization archives and retrieves the data. The environmental records are permanently stored at the Technical Support Building in locked storage.

Records are electronically stored in the Electronic Document Management System (EDMS), which provides full data protection through dual file storage, fail-over server technology, and off-line backup media, as described in PLN-883, "Records Management Plan—Electronic Document Management System (EDMS)." The EDMS primary storage server is located at the Willow Creek Building, with a fail-over server also located at the Willow Creek Building, and a backup server located at INTEC. The backup server maintains a full backup of all EDMS records, which are stored on optical disk.



There are three retention periods assigned for CERCLA records:

- Administrative Record (public access records) are retained 75 years after termination of the FFA/CO, with 90 days notification to the EPA for turnover of custody or copies of the records to be provided to them
- Public Involvement Records and Public Affairs Communications are retained permanently
- All other records are retained as a project case file for 10 years after termination of the FFA/CO, at which time notification is made to the EPA for approval for destruction.

In addition, the company has identified environmental records as applicable for long-term stewardship consideration and there is a hold-on destruction until specific retention is assigned by the National Archives for long-term stewardship records. These retentions are cited in PLN-476, "Document and Records Management Plan for the Balance of INEEL Cleanup Project," and in company-level retention matrix—List (LST) -9, "INEEL Records Schedule Matrix."

## **2. DATA ACQUISITION**

### **2.1 Sampling Process Design**

This section provides a general discussion of sampling process design. The project-specific FSPs, test plans, or work plans describe the relevant components of the sampling design, define the key parameters to be estimated, indicate the number and type of samples expected, and describe where, when, and how samples are taken. This section of the QAPjP addresses generic processes associated with sampling design, scheduling activities, rationale for design, design assumptions, procedures for locating and selecting samples, classification of measurements, and validation of nonstandard methods.

#### **2.1.1 Field Investigations**

The primary objective of field investigations is to obtain data that will help determine if no further action or an interim action is appropriate, based on the risk(s). A Track 2 investigation also might lead to an RI if additional information is required for remedy selection. The primary objective of an RI is to provide adequate information to determine the nature and extent of the threat posed by a site, which leads to a determination of no further action or remedial action (DOE-ID 1991a, pages 8–15). Field investigations also are used to determine which type of remedial action or removal action is necessary to reduce or eliminate risk. During RD/RA, data collection activities ensure that remedial action objectives have been met.

The objective of an FSP, SAP, or test plan—and this QAPjP—is to ensure that data meet the DQOs by providing a mechanism for planning and approving field activities. Specifically, the field data collection and subsequent data interpretation must define the nature and extent of contamination such that the associated risk(s) can be adequately defined.

The project-specific sampling design(s) will be addressed in the project-specific FSP or test plan and, unless referenced, will include the description of the conceptual model. Historically, Track 2 investigations or RIs had conceptual models where evaluation elements were identified. These elements include source (location and concentration of contaminants over time), pathway (media, rate of migration, and time and loss functions), and receptors (type, sensitivity, time, concentration, and number) (EPA 1987a, pages 3-6 through 3-9).

Field investigation sampling design features that will be addressed in the project-specific FSP or test plan include a list of all measurements, differentiating critical from noncritical samples; total number of samples; type of samples; and measurements planned for each sample (EPA 1989a, page 36). Critical samples are those samples required to achieve project objectives or limits on decision errors. Noncritical samples are those samples needed for information (EPA 1998a).

#### **2.1.2 Sample Site Selection**

The objective of the site selection and sampling procedures is to obtain samples that represent the environment being investigated or meet the scientific objectives of the project.

The DQOs are the scientific basis for the site selection. The sample population may be designed to be representative of the soil, water, or other media being investigated or may be nonrepresentative to meet the scientific objectives of the project. Sources of variability are the results of natural random processes and stem from environmental differences among the elements of a population. Variability is not usually reducible by further measurement, but it can be better estimated by increasing sampling (EPA 2002). The statistical method(s) and/or scientific objective(s) for determining sampling sites and frequency are

included in EPA guidance (EPA 1989b, pages 75, 140–169; EPA 1989c, pages 5-1 through 5-19). If the samples are collected in the recommended locations, the sample data will meet the project objectives. Variations from the proposed sample site(s) and the resulting impacts on the project's DQOs will be documented in the project report (e.g., RI report and summary report).

### **2.1.3 Sample Site Description**

The samples will be collected using EPA- and industry-accepted practices from the references previously listed. The project-specific DQOs and the critical measurements will be described in the project-specific FSP or test plan. A map of the proposed sample locations will be included in the project-specific FSP or test plan, and a map of the actual sample locations will be included in the project report (e.g., RI report and summary report).

## **2.2 Sampling Methods Requirements**

This section describes the procedure for collecting samples and identifies the sampling methods and equipment, including any implementation requirements, support facilities, sample preservation requirements, and materials needed.

The number and type of samples and analyses will be described in the project-specific FSP or test plan. In addition, the FSP or test plan will include a list of sample-specific analytes and will state the sampling method (e.g., grab). If an ASTM- or EPA-approved method is used, it will be cited in the FSP. References for the most commonly used methods are listed below.

- *Soil Sampling and Analysis for Volatile Organic Compounds* (EPA 1991b, pages 1–22)
- *Characterizing Soils for Hazardous Waste Site Assessments* (EPA 1991c, pages 1–16)
- *A Compendium of Superfund Field Operations Methods* (EPA 1987b, pages 7-1 through 7-9, 8.1-1 through 8.4-51, 13-1 through 13-10, 15-1 through 15-58)
- *Statement of Work for Organic Analysis-Multi-Media, Multi-Concentration* (EPA 1999)
- *Statement of Work for Inorganic Analysis-Multi-Media, Multi-Concentration* (EPA 1993b)
- *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods* (EPA 1986)
- *Methods for the Chemical Analysis of Water and Wastes* (EPA 1983).

If the sampling method is not an EPA-approved method, it will be described in detail in the project-specific FSP or test plan. Tables 2-1 and 2-2 of this QAPjP summarize the sample volumes, preservation, container types, and holding times (both before and after extraction) for many of the typically required analyses. Additions to, or deviations from, the guidelines in the tables (e.g., a test for which no requirements are listed or insufficient sample material will be available) will be detailed in the project-specific TOS/SOW and incorporated into the FSP or test plan. During the sampling process, the ASTM or EPA sampling methods will be used whenever possible (EPA 1987b, pages 6-1 through 6-16). If those methods are not applicable, more specific procedures have been developed, or management control procedures (MCPs) or SOPs/TPRs are used; those procedures (including the MCP or SAP/TPR revision number) will be referenced in or attached to the project-specific FSP or test plan. If samples cannot be collected at the designated location, then the FTL will select an alternate location and will

Table 2-1. Summary of sample collection, holding time, and preservation requirements.

Analysis	Sample Medium <sup>a</sup>	Volume/Mass	Container Type <sup>1</sup>	Holding Time	Preservative
Radiochemistry (see Table 2-2)	Water	See Table 2-2.	See Table 2-2.	See Table 2-2.	See Table 2-2.
Alpha spectroscopy Americium (Am-241) Curium (Cm-242 and Cm-244) Neptunium (Np-237) Plutonium (Pu-238, Pu-239/240, and Pu-242) Thorium (Th-228, Th-230, and Th-232) Uranium (U-234, U-235, and U-238)	Soil	≥10 g (per isotope or isotope combination)	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
Gamma spectroscopy Antimony (Sb-125) Cerium (Ce-144) Cesium (Cs-134 and Cs-137) Cobalt (Co-60) Europium (Eu-152, Eu-154, and Eu-155) Manganese (Mn-54) Ruthenium (Ru-106) Silver (Ag-108m and Ag-110m) Zinc (Zn-65) Other <sup>e</sup> (Results >2σ and >MDA) <sup>e</sup>	Soil	150–600 g (per sample)	16-oz wide-mouth jar	Analyze within 6 months. <sup>a,b</sup>	None

Table 2-1. (continued).

Analysis	Sample Medium <sup>a</sup>	Volume/Mass	Container Type <sup>1</sup>	Holding Time	Preservative
Other radionuclides Carbon (C-14) Iron (Fe-55) Nickel (Ni-59) Nickel (Ni-63) Plutonium (Pu-241) Strontium (Sr-89) Strontium (Sr-90) Strontium (Sr-89/90) Total Technetium (Tc-99)	Soil	≥10 g (per individual isotope)	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
Tritium (H-3)	Soil	5–200 g	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
Iodine (I-129)	Soil	10–15 g	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
Radium (Ra-226)	Soil	150–200 g	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
Radium (Ra-228)	Soil	150–200 g	Wide-mouth jar <sup>b</sup>	Analyze within 6 months. <sup>a,b</sup>	None
CLP metals	Soil	250 mL	Wide-mouth jar (glass or polyethylene)	Analyze within 6 months, except analyze Hg within 28 days. <sup>c</sup>	4°C <sup>c</sup>
CLP metals by Method SW-846	Water	2,000 mL	HDPE or low-density polyethylene bottle	Analyze within 6 months, except analyze Hg within 28 days. <sup>c</sup>	HNO <sub>3</sub> to pH<2 <sup>c</sup>
CLP volatiles	Soil	125 mL	Wide-mouth glass jar	Analyze within 14 days. <sup>d</sup>	4°C <sup>d</sup>
CLP volatiles	Water	2 × 40 mL <sup>e</sup>	40-mL glass vials	Analyze within 14 days. <sup>d</sup>	4°C, to pH <2 <sup>d</sup>
SW-846 Method 8260 volatiles	Water	2 × 40 mL <sup>e</sup>	40-mL glass vial, Teflon-lined cap <sup>k</sup>	Analyze within 14 days. <sup>j</sup>	4°C (add H <sub>2</sub> SO <sub>4</sub> to pH<2, as necessary) <sup>j</sup>
Volatile organics	Gas	Variable	Tedlar bag or summa canister	30 days from sample receipt to analysis.	Ambient temperature
CLP semivolatiles <sup>f</sup>	Soil	250 mL	Wide-mouth glass jar	Extract within 14 days, analyze extracts within 40 days of extraction. <sup>d</sup>	4°C <sup>d</sup>
CLP semivolatiles <sup>f</sup>	Water	1,000 mL <sup>e</sup>	Amber glass jugs	Extract within 7 days, analyze extracts within 40 days of extraction. <sup>d</sup>	4°C <sup>d</sup>
Acrolein and acrylonitrile	Water	2 × 40 mL <sup>e</sup>	40-mL glass vials with Teflon-lined cap	14 days.	4°C, adjust pH to 4–5

Table 2-1. (continued).

Analysis	Sample Medium <sup>a</sup>	Volume/Mass	Container Type <sup>1</sup>	Holding Time	Preservative
Anions	Soil	250 mL	Wide-mouth jar (glass, polyethylene, or HDPE)	Analyze within 48 hours for NO <sub>3</sub> and PO <sub>4</sub> ; all others 28 days. <sup>g</sup>	4°C <sup>g</sup>
Anions	Water	500 mL	HDPE, polyethylene, or glass bottle	Analyze within 48 hours for NO <sub>3</sub> and PO <sub>4</sub> ; all others 28 days. <sup>g</sup>	4°C <sup>g</sup>
TCLP volatiles	Soil	250 mL	Wide-mouth glass jar, Teflon-lined cap	Extract using zero headspace extraction within 14 days; analyze within 14 days of the zero headspace extraction. <sup>h</sup>	4°C <sup>h</sup>
TCLP metals, semivolatiles, pesticides, and herbicides	Soil	2,000 mL <sup>i</sup>	Wide-mouth glass jar, Teflon-lined cap	For metals except Hg: (a) complete TCLP extraction within 6 months and (b) complete DA within 6 months of TCLP extraction. For Hg: (a) complete TCLP extraction within 28 days and (b) complete DA within 28 days of TCLP extraction. For semivolatiles, pesticides, and herbicides: (a) complete TCLP extraction within 14 days, (b) complete preparative extraction within 7 days, and complete DA within 40 days of the preparation extraction. <sup>h</sup>	4°C <sup>h</sup>
EPA Method 524.2 (purgeable organic compounds)	Water	2 × 40 mL <sup>a</sup>	40-mL glass vial, Teflon-lined cap <sup>k</sup>	Analyze within 14 days.	4°C (add 25 mL ascorbic acid or HCl to pH<2, as necessary)
Chromium (VI)	Water	500 mL	HDPE or glass bottle	24 hours <sup>h</sup>	4°C <sup>h</sup>
Chromium (VI)	Soil	125 mL	Wide-mouth jar (glass polyethylene, or HDPE)	Extract within 30 days; analyze extract within 168 hours of extraction. <sup>m</sup>	4°C <sup>h</sup>
Pesticides/PCBs	Water	1,000 mL <sup>e</sup>	Amber-glass jugs	Extract within 7 days; analyze extracts within 40 days of extraction. <sup>j</sup>	4°C <sup>j</sup>
Pesticides/PCBs	Soil	250 mL	Wide-mouth glass jar	Extract within 14 days; analyze extract within 40 days of extraction. <sup>j</sup>	4°C <sup>j</sup>
TPH (Method 418.1)	Water	1,000 mL <sup>e</sup>	Amber glass	28 days. <sup>g</sup>	Add 5 mL of 50% HCl per L and cool to 4°C <sup>g</sup>

Table 2-1. (continued).

Analysis	Sample Medium <sup>a</sup>	Volume/Mass	Container Type <sup>1</sup>	Holding Time	Preservative
TPH (Method 8015) (gasoline range)	Water	2 × 40 mL <sup>e</sup>	Amber glass, Teflon-lined cap	14 days to analyze.	4°C (add HCl to pH<2, as necessary)
TPH (Method 8015) (diesel range)	Water	1,000 mL	Amber glass	Extract within 14 days; analyze within 40 days of extraction.	4°C (add HCl to pH<2, as necessary)
TPH (Method 8015) (gasoline ranges)	Soil	125 mL	Amber glass jar, Teflon-lined cap	14 days to analyze.	4°C
TPH (Method 8015) (diesel ranges)	Soil	250 mL	Amber glass	Extract within 14 days; analyze within 40 days of extraction.	4°C

a. The holding time requirement of 6 months is described in 40 CFR 136 (EPA guidelines for analysis of pollutants) and is applied in the QAPjP as a general guideline. For analysis of volatile radionuclides not listed above and/or radionuclides with short half-lives, the holding time will be adjusted accordingly and communicated to the laboratory in a project-specific TOS (contact the SAM Program for more information on appropriate holding times).

b. Sludge and sediment samples should be collected and preserved equivalently to soil samples. Samples known or suspected to contain solvents must use HDPE containers.

c. EPA (1993b)

d. EPA (1999)

e. Once each 20 samples or 14 days, whichever comes first; three times the normal sample volume is required (e.g., 3,000 mL instead of 1,000 mL, 6 × 40 mL instead of 2 × 40 mL).

f. Includes other extractable organics (extra volume might be required; contact the SAM Program).

g. EPA (1983)

h. EPA (1991d)

i. This sample volume can be reduced if the sample is dry (i.e., low moisture or free liquid content) or fewer groups of parameters (e.g., metals only or metals and semivolatiles only) are required. The SAM Program can provide specific guidance on required sample volumes.

j. EPA (1986)

k. Personal communication between Daryl Koch (IDEQ) and Donna Nicklaus (DOE-ID), April 4, 1994.

l. It is highly recommended that a certificate of cleanliness be obtained for all lots of sample containers used.

m. SW-846, Method 3060A ("Alkaline Digestion for Hexavalent Chromium").

CFR = *Code of Federal Regulations*

CLP = Contract Laboratory Program

DA = determinative analysis

EPA = U.S. Environmental Protection Agency

HDPE = high-density polyethylene

IDEQ = Idaho Department of Environmental Quality

PCB = polychlorinated biphenyl

QAPjP = quality assurance project plan

SAM = Sample and Analysis Management

TCLP = toxicity characteristic leaching procedure

TOS = task order statement of work

TPH = total petroleum hydrocarbon

Table 2-2. Summary of sample collection, holding time, and preservation requirements for radiological water analyses.

Analysis	Sample Medium	Approximate Volume <sup>a</sup>	Container Type	Holding Time <sup>c</sup>	Preservative
<b>Alpha spectrometry</b>					
Americium (Am-241)	Water	1 L	HDPE <sup>b</sup>	≤ 6 months	HNO <sub>3</sub> to pH <2
Curium isotopes (Cm-242 and Cm- 244)	Water	1–2 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Neptunium (Np-237)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Plutonium isotopes (Pu-238, Pu-239/240, and Pu-242)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Thorium isotopes (Th-228, Th-230, and Th-232)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Uranium isotopes (U-234, U-235, and U-238)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
<b>Gamma spectrometry</b>					
Antimony (Sb-125)	Water	0.5–2 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Cerium (Ce-144)					
Cesium (Cs-134 and Cs-137)					
Cobalt (Co-60)					
Europium (Eu-152, Eu-154, and Eu-155)					
Manganese (Mn-54)					
Ruthenium (Ru-106)					
Silver (Ag-108m and Ag-110m)					
Zinc (Zn-65)					
Other <sup>e</sup> (Results >2σ <u>and</u> >MDA) <sup>e</sup>					



Table 2-2. (continued).

Analysis	Sample Medium	Approximate Volume <sup>a</sup>	Container Type	Holding Time <sup>c</sup>	Preservative
<b>Specific analysis</b>					
Carbon (C-14)	Water	0.3–1 L	HDPE	≤ 6 months	None
Iodine (I-129)	Water	1 L–5 L	Amber-colored glass <sup>d</sup>	≤ 6 months	None
Iron (Fe-55)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Nickel (Ni-59)	Water	0.5–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Nickel (Ni-63)	Water	0.5–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Plutonium (Pu-241)	Water	1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Radium (Ra-226)	Water	1–4 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Radium (Ra-228)	Water	1–4 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Strontium (Sr-89)	Water	0.5–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Strontium (Sr-90)	Water	0.5–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Strontium (Sr-89/90) total	Water	0.5–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Technetium (Tc-99)	Water	0.5–2 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Tritium (H-3)	Water	0.1–0.5 L	HDPE/glass <sup>e</sup>	≤ 6 months	None
<b>Indicator Analyses</b>					
Gross alpha (gross $\alpha$ )	Water	0.3–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2
Gross beta (gross $\beta$ )	Water	0.3–1 L	HDPE	≤ 6 months	HNO <sub>3</sub> to pH <2

a. Volumes vary depending on the requested analysis and the laboratory performing the analysis (contact the SAM Program).

b. HDPE = high-density polyethylene.

c. The holding time requirement of 6 months is described in 40 CFR 136 (EPA guidelines for analysis of pollutants) and is applied in this QAPjP as a general guideline. For analysis of volatile radionuclides not listed above or radionuclides with short half-lives (e.g., I-131), the holding times will be adjusted accordingly and disseminated to the laboratory via a project-specific TOS (contact the SAM Program).

d. Collecting samples for I-129 in HDPE containers is permissible/acceptable; however, the holding time requirement is 28 days instead of 6 months.

e. Samples expected to contain high levels of tritium are recommended to be stored in glass containers.

CFR = Code of Federal Regulations

QAPjP = quality assurance project plan

TOS = task order statement of work

document the new location in the field logbook. If samples cannot be collected at an alternate location, then the FTL will contact the INEEL contractor project manager to obtain a new sampling strategy. If a new sampling strategy is necessary, the FSP and SAP will be revised and submitted for approval. Sampling equipment will be decontaminated in accordance with established procedures. The specific decontamination procedure (including revision number) applicable to the media being sampled and the levels of detection required will be cited in the project-specific FSP. The waste management section of the FSP describes the process for disposing of field decontamination waste.

## **2.3 Sample Handling and Custody Requirements**

This section discusses procedures required to ensure that samples are collected, transferred, stored, and analyzed by authorized personnel. Procedures that ensure the integrity of samples during all phases of sample handling and analysis also are discussed. An accurate written record must document sample handling and treatment from the time of its collection through laboratory procedures to disposal.

Sample custody procedures are followed to minimize accidents. Responsibility for all stages of sample handling must be assigned and problems must be documented. A sample is in custody if it is in actual physical possession or is in a secured area restricted to authorized personnel. The necessary level of custody depends on a project's DQOs. While enforcement actions necessitate stringent custody procedures, custody in other types of situations (e.g., academic research) may be primarily concerned only with the tracking of sample collection, handling, and analysis.

Unless otherwise specified in a project FSP or test plan, the sample handling and custody procedures used for INEEL CERCLA activities will be as defined in MCP-1192, "Chain of Custody and Sample Labeling for ER and D&D&D Projects." Examples of the chain-of-custody form, sample logbook sheet, and sample label are provided in Appendix B.

### **2.3.1 Sample Handling**

Samples must be properly prepared and shipped to the analytical laboratory in time to meet the holding times specified in Tables 2-1 and 2-2. Additions to or deviations from the guidelines in the tables (e.g., a test is required for which no requirements are listed or insufficient sample material will be available) are detailed in the project-specific FSP or test plan and the TOS prepared for the project.

### **2.3.2 Sample Shipping**

Sample packaging, marking, labeling, and transporting will follow EPA guidance (EPA 1987b, pages 6-8 through 6-16) and will meet present INEEL and U.S. Department of Transportation requirements. Samples will be screened for beta-gamma in the field and for gamma- and alpha-emitting radionuclides before shipment to off-Site laboratories. Screening thresholds will be set in individual FSPs to ensure that the SAM Program and off-Site laboratories are consulted when radiation thresholds are exceeded.

When shipping water samples that require preservation with acids, the language found in 40 CFR 136.3, "Identification of Test Procedures," must be considered. This part of 40 CFR designates the amounts of acids that may be present in aqueous samples without requiring designation as hazardous material under U.S. Department of Transportation regulations.

The exact language in 40 CFR 136.3, Table II, Footnote 3 is as follows:

When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the hazardous materials regulations do not apply to the following materials: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH of about 1.96 or greater); nitric acid (HNO<sub>3</sub>) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

Equation (1) below is used to calculate the maximum amount of acid that may be added to a water sample before shipment.

$$\text{number of milliliters of acid or base you may add to your sample} = \frac{(Wt.\%_{\text{allowed}})(Volume_{\text{sample}})(\rho_{\text{sample}})}{(\rho_{\text{preservative}})(Wt.\%_{\text{starting}})} \quad (1)$$

base you may add to your sample

where

Wt. %<sub>allowed</sub> = the weight percent of the material allowed in 40 CFR 136.3, Table II, Footnote 3.

Wt.%<sub>starting</sub> = the weight percent of the acid (or base) that you are using as preservative. This information can be found on the label of the bottle. For example, Fisher brand, Optima grade, concentrated HNO<sub>3</sub> is 69–71% pure by weight; HCL is 35–37% pure by weight; and H<sub>2</sub>SO<sub>4</sub> is 95–98% pure by weight. When a range is given, use the maximum to ensure that your calculation is conservative.

$\rho_{\text{sample}}$  = the density of the water sample after the acid or base has been added (assume this is equal to 1.00 g/mL).

$\rho_{\text{preservative}}$  = the density of the acid or base preservative you are using in grams/milliliter.

Volume<sub>sample</sub> = the volume of the sample collected in milliliters.

**2.3.2.1 Sample Containers.** Sample containers will be precleaned using the appropriate cleaning protocol for the analytical method that will be used to analyze the sample. Any questions concerning appropriate cleaning protocol should be addressed with the SAM Program. Precleaned sample containers will be ordered from the supplier. A certificate of analysis for each container lot is not required but is highly recommended, and each order of containers will be associated with a lot number for traceability.

### **2.3.3 Sample Custody**

Following EPA guidance (EPA 1987b, pages 4-1 through 4-13) and ICP procedures, a representative of the WAG will directly or indirectly supervise all activities concerning sample custody from the field to shipment to the laboratory. As a routine portion of the SAM laboratory audits, the sample custody procedures used in the laboratories are reviewed to determine if those procedures are in accordance with EPA guidance.

A systematic character identification code is used to uniquely identify all samples. Uniqueness is required for maintaining consistency and preventing the same identification code from being assigned to more than one sample. The sampling-activity field identification contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (field data, analytical data, etc.) to information in the SAP table for purposes of data reporting, sample tracking, and completeness reporting. The analytical laboratory also will use the sample number to track and report analytical results. A two-character set (i.e., 01, 02) then will be used to designate the number of samples to be collected (e.g., field duplicate samples). The last two characters refer to a particular analysis type. The SAP tables are included in the FSP.

## **2.4 Analytical Method Requirements**

One or more mobile and/or fixed analytical laboratories may be used during the investigations. The following must be considered before selecting a laboratory: the DQOs of the task, the laboratory's approval status and/or certification, the laboratory's status under the NE-ID analytical services make or buy policy, and the laboratory's acceptance criteria regarding the radioactive content of samples. As part of the QA/QC program, each laboratory must be assessed and approved by SAM and Quality Assurance personnel before use to evaluate its analytical procedures, calibration, and QA/QC program.

The SAM Program awards long-term (typically 3–5 years) BMCs to laboratories that perform the standard EPA and ASTM test methods for radiological, organic, inorganic, and miscellaneous classical analyses. An Analytical Services SOW describes routine requirements for all laboratory operations common to every project's samples (e.g., sample custody, handling, storage, data reporting, and delivery schedules). Each project that uses the BMC laboratories also has one or more TOS prepared that describes any additional analysis requirements or deviations from the Analytical Services SOW. The BMC requires that the laboratories have chemical hygiene plans, sample control procedures, and waste management procedures. Those documents are evaluated as part of the onsite audit and the implementation of those practices is observed.

The SAM Program completes a cursory review on data received from the laboratories. Based on project DQOs, some of the data also undergoes a more thorough and structured analytical method data-validation process. Both of those processes evaluate the adequacy of the data and look for indicators of a failure in the analytical system. If a failure is identified, then the SAM Program works with the laboratory to correct the data, if possible, and requests corrective actions from the laboratory. In addition, if a problem is noted during laboratory analysis, the laboratory is required to contact the SAM Program to resolve the problem or rerun the analyses. The Analytical Services SOW and specific TOSs describe the data deliverable and the action required of the laboratory if an analytical system failure occurs. The laboratory must document system failures and corrective actions taken in the case narrative along with flagging any affected data.

### 2.4.1 Subsampling

Subsampling operations in the laboratory are critical for obtaining a measurement representative of the material contained in the sample collection vessel. Unless specific requirements for subsampling are specified in the project TOS, the laboratories will use internal SOPs for performing this task. The SAM Program reviews these procedures during onsite evaluations to ensure that the subsampling techniques are appropriate for obtaining a representative subsample.

### 2.4.2 Preparation of Samples

The appropriate preparation of samples is critical to ensure regulatory acceptance and technical defensibility of the data produced. The EPA has approved sample preparation techniques that are specific to the matrix of the sample and the analytes of interest. When these methods are used, the SAM Program ensures that the appropriate sample preparation methods are called out in the TOS(s) prepared for each project. Because no standard EPA or ASTM sample preparation methods have been defined, the radiological master task subcontract SOW allows laboratories to use their own internal SOPs for sample preparation, provided all specified criteria (e.g., total dissolution of solid samples) are adequately addressed. To ensure the laboratories under contract perform adequate sample preparation for radiological analyses, the SAM Program reviews their SOPs for these operations during preaward onsite assessments.

### 2.4.3 Analytical Methods

Typically, all samples will be analyzed in the laboratory by EPA-approved methods, American National Standards Institute standard methods, ASTM industry-accepted methods, or other methods required by the Analytical Services SOW and TOS prepared by the SAM Program (ER-SOW-394). The following EPA methods may be used:

- *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods* (EPA 1986)
- *Methods for the Chemical Analysis of Water and Wastes* (EPA 1983)
- *Statement of Work for Organic Analysis-Multi-Media, Multi-Concentration* (EPA 1999)
- *Statement of Work for Inorganic Analysis-Multi-Media, Multi-Concentration* (EPA 1993b)
- *Methods for the Determination of Organic Compounds in Drinking Water* (EPA 1988).

Required test methods that are not offered by any laboratory operating under a BMC are procured using a work order document referred to at the INEEL as a stand-alone SOW. Stand-alone SOWs are issued to interested laboratories under project-specific Requests for Proposal.

Specific analyses for samples will be documented in the project-specific FSP or test plan and, if a standard method is not used, detailed descriptions of the method or references will be provided. The most commonly used methods for geotechnical and physical property measurements are in Table 2-3. The most commonly used methods for radiological and hazardous constituent analyses are described in Tables 1-6 through 1-11. If samples are analyzed in the field, then EPA-approved standard methods, nonstandard methods, or modified methods will be used as specified in the project-specific FSP or test plan. When project DQOs require the standard laboratory methods to be modified, these modifications will be specified in the TOS(s) prepared for the project. When these modifications result in deviations from the precision, accuracy, and detection limit information provided in this document, the details of the differences will be provided in the project FSP.

Table 2-3. Physical property measurement methods.

Measurement Parameter	Reference	Sample Condition
Saturated hydraulic conductivity:		Undisturbed sample or laboratory synthesized
Constant head method	Klute (1986), Part 1, page 694 or ASTM D2434-68/ D5084-90/D5856-95	
Falling head method	Klute (1986), Part 1, page 700 or ASTM D2434-68/ D5084-90/D5856-95	
Unsaturated hydraulic conductivity:		Undisturbed sample or laboratory synthesized
Mualem method	Klute (1986), Part 1, Chapter 31	
Van Genuchten method	Van Genuchten (1980), pages 892–898	
Moisture retention characteristic curve:		Undisturbed sample
Porous-plate apparatus method (medium- or coarse-grained media)	Klute (1986), Part 1, Chapter 26 or ASTM D2325-68	
Pressure-membrane apparatus method (fine-grained media)	Klute (1986), Part 1, Chapter 26 or ASTM D3152-72	
Porosity	Klute (1986), Part 1, Chapter 18 or ASTM C493-98	Porosity is often calculated using bulk density and particle density. Thus, the sample conditions listed in this table for bulk density should be followed.
Bulk density	Klute (1986), Part 1, Chapter 13	Undisturbed sample is desirable, but the sample might settle during sample transport. The sampling methods in Klute (1986), Chapter 13, must be followed to ensure accurate measurements of this property.
Atterberg limits	ASTM D4318-00	Disturbed sample
Particle density	Klute (1986), Part 1, Chapter 13 or ASTM D854-02	Disturbed sample
Particle size distribution: Mechanical sieve (particle sizes >75 $\mu\text{m}$ ) and hydrometer (particle sizes <75 $\mu\text{m}$ )	Klute (1986), Part 1, Chapter 15 or ASTM D422-63	Disturbed sample

Table 2-3. (continued).

Measurement Parameter	Reference	Sample Condition
Water content:		Sample may be disturbed/undisturbed.
Gravimetric	Klute (1986), Part 1, page 503 or ASTM D2216-98	If disturbed, the bulk density of the soil must be measured to determine volumetric water content.
Volumetric	Klute (1986), Part 1, page 494	
Specific Gravity of Soil:		
Maximum grain size <4.75 mm	ASTM D854-02	Disturbed sample
Maximum grain size >4.75 mm	ASTM C127-88	Disturbed sample
Permeability:		
Soil (air permeability)	Klute (1986), Part 1, Chapter 48	
Rock (air permeability)	ASTM D4525-90	
Granular soil (grain size predominantly >75 µm)	ASTM D2434-68	
Viscosity of petroleum products	ASTM D445-03 or ASTM D2983-02b	
Free liquid	SW-846 Method 9095 (EPA 1986)	
Screening apparent specific gravity and bulk density of waste	ASTM D5057-90	
Total organic carbon in soil	Klute (1986), Part 2, Chapter 29	Sample may be disturbed but not sieved.
Mineralogy (x-ray diffraction)	ASTM D934-80	Sieve through 35-mesh sieve.
Cation exchange capacity	SW-846 Method 9081 (EPA [1986]) or page 1,982, Part 2, Chapter 8	Sample may be disturbed but not sieved.
Inorganic carbon	Page 1,982, Part 2, pages 181–189	Sample may be disturbed.
Iron oxide/hydroxide	Klute (1986), Part 1, Chapter 6	Sample may be disturbed.
pH	Page 1,982, Part 2, Chapter 12 or ASTM D4972-01	Sample may be disturbed.
Heat capacity/specific heat	Klute (1986), Part 1, Chapter 38 or ASTM D4611-86	Sample may be disturbed.
Thermal conductivity/diffusivity	Klute (1986), Part 1, Chapter 39 or ASTM D5334-00	Undisturbed sample

Table 2-3. (continued).

Measurement Parameter	Reference	Sample Condition
Laboratory compaction characteristics of soil using standard effort	ASTM D698-00a	Disturbed sample
Density and unit weight of soil in place by the sand-cone method	ASTM D1556-00	In situ test with disturbed laboratory samples
Laboratory compaction characteristics of soil using modified effort	ASTM D1557-02	Sample may be disturbed.
Unconfined compressive strength of cohesive soil	ASTM D2166-00	Undisturbed sample
One-dimensional consolidation properties of soil	ASTM D2435-03	Undisturbed sample
Unconsolidated, undrained compressive strength of cohesive soil in triaxial compression	ASTM D2850-03	Undisturbed sample
Density of soil and soil-aggregate in place by nuclear methods (shallow depth)	ASTM D2922-01	In situ
Water content of soil and rock in place by nuclear methods (shallow depth)	ASTM D3017-01	In situ
Surface area (multipoint bet)	ASTM C1069-86(1997)e1	Disturbed sample
Surface area (water sorption)	Soils Science Society of America Journal 1982	
Partition coefficients	ASTM D4319-93(2001) ASTM E1147-92(1997)	Undisturbed or disturbed sample
Extractable metals	SW-846, Method 3050	
Calculated total porosity	Methods of Soil Analysis, Chapter 18	
Calculated unsaturated hydraulic conductivity	Soils Science Society of America Journal 1982	
Hydraulic conductivity	ASTM D5058-90(2001)	
Split tensile strength	ASTM C496-96	
ASTM = American Society for Testing and Materials EPA = U.S. Environmental Protection Agency		



## **2.5 Quality Control Requirements**

Internal quality control checks have been established for both field and laboratory methods. The QA objectives described in Section 1.4 of this QAPjP specify how the project will be statistically evaluated. This section states how these specifications will be achieved.

### **2.5.1 Field Quality Control Requirements**

Several types of internal QC checks that may be collected during field sampling include duplicate samples, split samples, field blanks, trip blanks, equipment blanks, and PE samples—as shown in Table 1-5 or in the SAP tables in the project-specific FSP or test plan. A discussion regarding the statistical evaluation of QC indicators is contained in Section 4.3 of this QAPjP.

### **2.5.2 Laboratory Quality Control Requirements**

The internal laboratory QC checks, including the type and frequency of QC samples and calculation of data quality indicators, are described in the Analytical Services SOW, which is prepared by the SAM Program. The laboratory master task subcontract SOWs contain specific acceptance limit criteria for the QC check measurements required by the methods (e.g., method blanks, matrix and surrogate spikes, and calibration checks) and required corrective action when these limits are exceeded. If more stringent criteria than those specified in the Analytical Services SOW are required for a project, they will be described in the FSP and TOS.

The Analytical Services SOW and the analytical methods delineate the specifications for the applicable data quality indicators, including the formulas used to measure those indicators. Analytical method data validation (AMDV) TPRs identify the processes used to evaluate and qualify data that are noncompliant with the SOWs. Laboratories are required to maintain QC charts for data that are generated by analytical methods that require such charts. Confirmation that required charts are being maintained by the laboratories can be obtained either through onsite audits or by requesting that copies of those charts be sent directly to the INEEL.

The Analytical Services SOW requires adequate spare parts and/or backup instrumentation. Existence of critical spare parts, maintenance contracts, and/or backup instrumentation is verified during the onsite laboratory audit.

The effectiveness of laboratory corrective actions is determined by continuing to monitor the laboratories' performance using the Laboratory Performance Evaluation Program. The Laboratory Performance Evaluation Program provides monitoring and assessment guidelines used to ensure that high quality and defensible analytical data are being supplied by subcontracted and government-operated laboratories that support the DOE programs at the INEEL.

Interpretation of PE sample results is included in the AMDV reports issued for radiological analyses (when these samples are specified for use in an FSP). When PE samples are included for other analyses (as specified in an FSP), the method for evaluating the results of these samples also will be described in the FSP.

## **2.6 Instrument Testing, Inspection, and Maintenance Requirements**

The INEEL contractor maintains a calibration program in compliance with American National Standards Institute/National Conference of Standards Laboratories (NCSL) Z540.1, "Calibration Laboratories and Measuring Test Equipment—General Requirements," or equivalent. That program

controls measuring and test equipment used in the field and onsite laboratory. The FTL ensures that equipment of the proper type, range, accuracy, and precision is used to provide data compatible with project requirements and desired results.

Preventive maintenance for field equipment is addressed in site-specific FSPs, test plans, or work plans. Preventive maintenance includes routine source or calibration gas checks of field instrument and periodic recalibration of the instrument. Records of the calibrations, source checks, and calibration gas checks, where applicable, will be maintained consistent with the FFA/CO requirements.

## **2.7 Instrument Calibration**

The FTL ensures that the field sampling equipment is calibrated appropriately in accordance with the manufacturer's recommendations. The radiological control technician is responsible for maintaining and documenting the calibration of the radiological equipment, and the industrial hygienist is responsible for maintaining and documenting the calibration of the industrial hygiene equipment. Calibration of field instruments will be documented in a field-instrument calibration/standardization logbook.

The contractor has established specific procedures for initial approval of analytical laboratories. Equipment will be calibrated according to the manufacturer's recommendations and SOWs, which define calibration frequency and acceptance criteria.

## **2.8 Inspection/Acceptance Requirements for Supplies and Consumables**

The supplies and consumables used during ICP activities include sample containers, chemicals, deionized water, and potable water. Sample containers are received by the field team and are verified clean using the certifications provided by the supplier. The acceptance criteria for the containers are correct quantity and size, correct container type, and certified clean. Details concerning the certifications, inspection/acceptance testing requirements, acceptance criteria, testing method, frequency of testing, and responsible individuals will be detailed in the project-specific FSP if additional supplies are required (e.g., standards for field measurements).

All chemicals used as a preservative will be of high purity and purchased from a nationally recognized supplier of chemicals and inspected by the field team before use. The correct grade and type of chemical will be verified using the container label and accompanying documentation.

Deionized water is obtained from a reputable supplier of deionized water or obtained from one of the available onsite sources. If the deionized water is obtained from a supplier, then the marking on the container is used to verify that the water is deionized. If the water is obtained from one of the onsite supplies, then data from the last test of the water system are used.

Potable water is used at various points in the process and no acceptance or verification of that water is done specifically to verify acceptability for use on the project. If potable water is used in the decontamination process, then the final rinses are with deionized water, thereby eliminating the need to verify the quality of the potable water.

The FTL is responsible for documenting the inspections in the FTL logbook. The documentation in the logbook will include unique identification of the supplies, the date received, the date tested, the date retested (if applicable), and the expiration date for supplies having an associated shelf life. If the supplies or consumables are inspected by the on-Site quality-receiving inspection organization, then a green

“accept” tag will be attached to the item or container. That green tag will be retained with the project files.

The FTL is responsible for verifying that all supplies and consumables have been inspected before those supplies are used. That verification should be part of the prejob evaluation of readiness.

## 2.9 Data Acquisition Requirements (Nondirect Measurements)

The ICP uses nondirect measurement data during various phases of a project. Nondirect measurement data are data from previously collected samples or process information that will be used on a specific project. When that type of data is used, the WAG manager evaluates the data against the following criteria and documents the evaluation in the project files for the WAG.

- **Representativeness:** Were the data collected from a similar population?
- **Bias:** Are there characteristics of the data that would shift the conclusions?
- **Precision:** How is the spread in the results estimated?
- **Qualifiers:** Are the data evaluated in a manner that permits logical decisions on whether the data are applicable to the current project?
- **Summarization:** Is the data summarization process clear and sufficiently consistent with the goals of the project?

The documented evaluation will include any limitations on the use of the data and the nature of the uncertainty of the data.

## 2.10 Data Management

This section summarizes the processes used to generate, validate, interpret, track, store, and retrieve data at the INEEL.

### 2.10.1 Data Recording

During the data acquisition process, raw (as-collected) data are typically subject to mathematical operations that reduce the data to a meaningful expression (e.g., a concentration in a specific unit). The internal checks used by ICP to ensure data quality during data encoding by laboratories in the data entry process are accomplished by using the raw data to manually verify the concentrations reported. The formulas used for these manual verifications are documented in the SAM analytical method data-validation procedures. During data entry in electronic databases, data verification procedures involving second person review of the data entered ensures the quality of the electronically captured data.

### 2.10.2 Data Validation

The AMDV is the review of measurements and analytical results to confirm that those method requirements have been achieved. The primary purpose of AMDV is to ensure the legal and/or technical defensibility of the data. Therefore, AMDV should be performed on all data that may be used to decide the final action at a site. The SAM Program is responsible for AMDV. The SAM Program defines two levels of AMDV: (1) Level A AMDV and (2) Level B AMDV.

Level A AMDV is a thorough process that consists of data confirmation, data clarification, and data appraisal. Data confirmation is the process of correlating the reported data within a given data package to its corresponding raw data. Data clarification is the process of qualifying or flagging reported analytical results based on strict adherence to their applicable validation SOP (TPRs -80, -81, -82, and -174, and Guide [GDE] -201) and/or justifiable professional judgment by the data validator. Data appraisal is the formulation of a comprehensive L&V report that documents the entire AMDV process. Level B AMDV is a superficial process that includes only data clarification and data appraisal.

Analyses obtained using a laboratory SOW prepared by the SAM Program will generate adequate QC information to satisfy the required level of validation. The procedures for AMDV, including determining outliers and appropriate qualification flags, are outlined in the following TPRs and GDE:

- TPR-80, “Radioanalytical Data Validation”
- TPR-81, “Validation of Volatile Organic Compounds Data Analyzed Using Gas Chromatography/Mass Spectrometry”
- TPR-82, “Validation of Gas and Liquid Chromatographic Organic Data”
- TPR-174, “Validation of Semi-Volatile Organic Compounds Data Analyzed Using Gas Chromatography/Mass Spectrometry”
- GDE-201, “Inorganic Analyses Data Validation for INEEL Sample and Analysis Management.”

Additional data validation information can be found in GDE-7003, “Levels of Analytical Method Data Validation.”

### **2.10.3 Data Transformation**

Data reporting requirements during the data collection, transfer, storage, recovery, and processing steps—including laboratory QC, field QC, and the organizations responsible—are documented in contractor procedures. Use of logbooks and chain-of-custody forms also are described in contractor procedures. Sample and data storage requirements are addressed in the SAM Analytical Services SOW and applicable stand-alone SOWs.

Data transformation involves conversion of individual data point values or possibly symbols using conversion formulas (e.g., unit conversion or logarithmic conversion) or a system for replacement. Most data conversions used in ICP data acquisition are performed at the analytical laboratories or in the field during the performance of field measurements. All requirements for data transformation are detailed in the analytical methods used for data acquisition. If additional data transformation operations are required, they will be specified in FSPs.

### **2.10.4 Data Reduction**

The calculations that will be used to evaluate the precision, accuracy, representativeness, completeness, and comparability parameters are in Section 4.3 of this QAPjP. Data reduction occurs at two points in the data collection and interpretation process: (1) in the laboratory and (2) following receipt of the data. The laboratory will perform reduction of raw laboratory data following procedures that the SAM Program has reviewed and approved. Data reduction of the analytical data for interpretation, if required, may occur in conjunction with a statistician, and it will be documented in the project report.

### **2.10.5 Data Analysis**

Data analysis involves comparing reduced data with a conceptual model (e.g., dispersion model or groundwater vadose zone transport model). This can involve computation of summary statistics, standard errors, confidence intervals, tests of hypotheses relative to model parameters, and goodness-of-fit tests. The project-specific FSPs will briefly outline the proposed methodology for data analysis to be conducted for the project. Discussions that are more detailed are provided in reports summarizing project data.

### **2.10.6 Data Tracking**

Data are tracked through the data processing system using the SAM Sample and Data Tracking System (SADTS). Tracking of samples and data is initiated when the data entered in the SAP table application is uploaded to SADTS. These data indicate the sample numbers for which collection is planned. The chain-of-custody information submitted to the SAM Program is then used to begin tracking collected samples. Sample collection dates, laboratory sample receipt, receipt of data from the laboratory, submittal of data for data validation, transmittal of the validation report, and sample waste disposal are all recorded in the SADTS.

### **2.10.7 Data Storage and Retrieval**

Hard copies of analytical data received are stored in the SAM data storage areas as QA records in accordance with the PLN-476, "Document and Records Management Plan for the Balance of INEEL Cleanup Project." Electronic data are initially entered in the SAM Integrated Environmental Data Management System and are subsequently uploaded to the Environmental Data Warehouse. All security requirements for electronic data are described in the *Data Management Plan for the Idaho National Engineering Laboratory Environmental Restoration Program* (INEL 1995).

## **3. ASSESSMENT/OVERSIGHT**

### **3.1 Assessments and Response Actions**

Two general evaluations must be conducted: (1) system evaluations/assessments and (2) PE/assessments. Project-specific scheduling of assessments is documented in the FSP. Postevaluation reports also are described in this section.

#### **3.1.1 Field Surveillance**

At least one system/PE (i.e., self-assessment, quality field surveillance, and independent assessment) will be performed and documented (e.g., field surveillance checklist) to ensure that the sample documentation, collection, preparation, storage, and transfer procedures are in place before or shortly after field activities commence. The evaluation, or combination of evaluations to be performed for a project, will be specified in the FSP and test plan. The project manager identifies a project schedule on the ICP planned field schedule. The evaluations will verify that the sampling organization is operational; written procedures for sampling are available and being followed; specified equipment is available, calibrated, and in proper working order; and work is done in compliance with this QAPjP. Deficiencies noted during those assessments are entered into an electronic database for tracking.

#### **3.1.2 Contractor-Expanded Review**

This qualitative assessment may be used to determine a project's readiness to proceed. The contractor-expanded reviews (CERs) may be done by the INEEL contractor or NE-ID personnel. The level of rigor used in completing a CER depends on the complexity of the activity. For simple field screening activities, a peer review may be done to satisfy the CER. In highly complex activities where risk may be moderate or high, a rigorous readiness review may be done to satisfy the CER requirements.

#### **3.1.3 Readiness Reviews**

Readiness reviews, as defined by the DOE, are "systematic, documented, performance-based examinations of facilities, equipment, personnel, procedures, and management control systems to ensure that a facility will be operated safely within its approved safety envelope as defined by the facility safety basis." This definition is similar to the one provided in *EPA Guidance for Quality Assurance Project Plans* (EPA 1998a). Readiness reviews are done for relatively high-risk activities and less rigorous readiness assessments or management system reviews are completed for the lower risk activities. In either case, individuals with appropriate technical expertise are asked to review the preparedness of the activity before that activity starts. That review culminates in a recommendation to start the field activities. Routinely, the same type of review is not done at the initiation of a project, but is done only before fieldwork starts.

#### **3.1.4 Technical Systems Audits**

Technical systems' audits are not routinely completed as a single activity but rather a collection of self-assessments and management assessments completed over the project's life. Routine self-assessments evaluate compliance with the HASP, procedures, and training requirements. Those assessments include the use of FTL checklists, QA surveillances, and real-time monitoring by radiological control technicians, industrial hygienists, industrial safety professionals, and environmental specialists. In addition, the DOE conducts independent evaluations of field activities to verify compliance to requirements. Both the IDEQ and EPA may participate in any or all the assessments discussed.

### **3.1.5 Performance Evaluation**

Performance evaluation samples are used by projects to evaluate the laboratory's proficiency. Specific PE sample requirements are listed in the FSP. Interpretation of PE sample results is included in the AMDV reports issued for radiological analyses. When PE samples are included for other analyses, the method for evaluating the results of those samples is described in PLN-862, "Performance Evaluation Sample Program Plan," or in the FSP.

### **3.1.6 Audit of Data Quality**

Processes used at the INEEL to audit data quality are cursory reviews and AMDV (see Sections 2.10 and 4 of this QAPjP). Additional data reviews are specified in the FSP, test plan, or work plan.

### **3.1.7 Data Quality Assessment**

Data quality assessments (DQAs) are completed at various stages of a project. At the completion of the RI/FS phase, a DQA is completed. In addition, at the end of the remedial action, a DQA is completed and documented as part of the remedial action report. The process entails reviewing analytical method validated data against DQOs to evaluate acceptability of total measurement error. Various statistical tools are used to complete DQAs. The project-specific documents describe the statistical methods used on that project.

### **3.1.8 Documentation of Assessments**

Evaluation reports will be completed by the person(s) doing the evaluation. The report will document (as a minimum) the date of the assessment, the name(s) of the assessors and persons contacted, activities assessed, deficiencies, and other pertinent information. A reference will be made in the report to the deficiency numbers in the electronic database. Scheduling of the assessments and organizations responsible for the assessments are established by the FSP, work plan, test plan, or by agreement with the DOE, EPA, and IDEQ.

## **3.2 Report to Management**

Project reports (e.g., RI report, summary report, and RA report) will summarize and/or reference all documentation that affects the project DQOs. The recipients of the reports are defined in the FFA/CO and work plans. The FFA/CO requires monthly written progress reports that describe the actions taken during the previous month. In addition, the monthly report will describe activities scheduled for the next 3 months. The DOE, IDEQ, and EPA will define additional reporting requirements. The report will be written by the INEEL contractor for the DOE. Reports will be provided to NE-ID, IDEQ, and EPA, with copies provided to DOE and INEEL contractor WAG managers.

Results of DQA and other evaluations of project compliance to FFA/CO or QAPjP requirements will be provided to the DOE, EPA, and IDEQ as part of the monthly report or as part of individual OU RI/FS and RA reports.

## 4. DATA VALIDATION AND USABILITY

### 4.1 Data Review, Validation, and Verification Requirements

This section states the criteria for deciding the degree to which each data item has met its quality specifications. Detailed discussion of the following areas is located in the previous sections.

- ***Sampling Design.*** Acceptance tolerances for each critical sample coordinate and the action to take, if the tolerances are exceeded, are specified in FSPs.
- ***Sample Collection Procedures.*** Details of how a sample is separated from its native time/space location are provided in Section 2.2, “Sampling Methods Requirements.” Acceptable departures (e.g., alternate equipment) from those methods stated in this document or the FSP, and the action to be taken if the requirements cannot be satisfied, will be documented in the FSP or test plan.
- ***Sample Handling.*** Details of how a sample is physically treated and handled during relocation from its original site to the actual measurement site are given in Section 2.3, “Sample Handling and Custody Requirements.” At a minimum, the sample containers and preservatives will be evaluated when Level A AMDV is performed by the SAM Program to ensure that they were appropriate for the nature of the sample and the type of data generated from the sample. In addition, checks on the identity of the sample (e.g., proper labeling and chain-of-custody records) will be made to ensure that the sample continues to be representative of its native environment as it moves through the analytical process.
- ***Analytical Procedures.*** All sample data received by the SAM Program are verified to ensure that the procedures used to generate the data were implemented as specified in the FSP and TOS. This is done within the limitations of the data package received. For example, there is no means to verify that a specific analytical method was used when all that is received from a laboratory is a summary sheet listing a method number. When these abbreviated data packages are received, the SAM Program can only verify that the number on the reporting form corresponds to the method number requested. No raw data can be reviewed to verify that the method criteria were met or that the method was actually used. Acceptance criteria and the suitable codes (flags) for characterizing each sample’s deviation from the procedure are described in Section 2.4, “Analytical Methods Requirements,” and in the AMDV TPRs used by the SAM Program.
- ***Quality Control.*** The specified QC checks, the procedures, acceptance criteria, and corrective action are specified in Section 2.5, “Quality Control Requirements.” When the SAM Program performs Level A or B AMDV, the fact that required corrective actions were taken, which samples were affected, and the potential effect of the actions on the validity of the data are documented in L&V reports.
- ***Calibration.*** The calibration of instruments and equipment is addressed in Section 2.7, “Instrument Calibration.” When the SAM Program performs Level A or B AMDV, calibration requirements are addressed. Specifically, the fact that required corrective actions were taken when calibration criteria were exceeded, which samples were affected, and the potential effect of the actions on the validity of the data are documented in L&V reports.
- ***Data Reduction and Processing.*** How information generation is checked, the requirements for the outcome, and how deviation from the requirements will be treated are addressed in Section 2.10, “Data Management.”



## 4.2 Validation and Verification Methods

The details of the process for validating (determining if data satisfy QAPjP-defined user requirements) and verifying (ensuring that conclusions can be correctly drawn) project data are given in Section 2.10.2, “Data Validation.” The project is responsible for specifying in the project-specific FSP the level of AMDV that will be used. Upon data receipt, the SAM Program is responsible for verifying that the method requested in the FSP, test plan, TOS, and/or SOW was the method used to analyze the samples. The SAM Program also is responsible for completing any other AMDV required in the FSP or test plan. The project is then responsible for completing the DQA.

## 4.3 Reconciliation with Data Quality Objectives

The DQA is a key part of the data life cycle’s assessment phase. A DQA protocol will be developed for each investigation, which will determine how well the validated data can support their intended use. The guidance for conducting a DQA, which is found in *Guidance for Data Quality Assessment* (EPA 1998b), will be used (when applicable). During the DQA, one or more of the subjects discussed in the following subsections typically will be involved.

### 4.3.1 Corrective Action

Corrective action procedures are implemented when samples do not meet established QA/QC standards. Two types of corrective action are discussed: (1) laboratory corrective action(s) and (2) field corrective action(s).

**4.3.1.1 Laboratory Corrective Action(s).** The laboratory manager, SAM, and the project manager are responsible for ensuring that laboratory QA/QC procedures are followed. Laboratory situations requiring corrective actions, the appropriate corrective action, and the documentation requirements will be specified in the laboratory SOW prepared by the SAM Program in accordance with MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.” If notified by the laboratory of a situation that might affect the project DQOs, then the SAM Program will notify the project manager of the situation and the corrective actions being implemented.

**4.3.1.2 Field Corrective Action(s).** The FTL and project manager are responsible for ensuring that field QA/QC procedures are followed. If a situation develops that could jeopardize the integrity of the samples, then the FTL and project manager will document the situation, the possible impacts to the DQOs of the project, and the corrective actions taken. The project manager will notify or consult with appropriate individuals. The situation and impacts on the project DQOs will be described in the Track 2 scoping summary report or RI report.

### 4.3.2 Calculation of Data Quality Indicators

The data quality indicators of precision, accuracy, and completeness are addressed in Section 1.4, “Quality Control Objectives,” and Section 2.5, “Quality Control Requirements,” of this QAPjP. The equations that will be used to calculate and report those data quality indicators are described in this section. Unless otherwise indicated, all calculations were calculated in accordance with EPA guidance (EPA 1991a, pages 43–45).

**4.3.2.1 Precision.** Typically, one of four common calculations will be used to assess various measurements for precision. The RPD or RSD is calculated for every contaminant for which field or laboratory duplicates and/or splits exist. The precision of the absolute range (PAR) can be used when the absolute variation between two measurements is more appropriate. The mean difference is a standard

statistical method of assessing the difference between two radioactivity measurements and determining the significance of that difference.

The RPD is used when there are two observed values (i.e., field collocated duplicates, field splits, laboratory duplicates, and laboratory matrix spike/matrix spike duplicates). The RSD is used when there are more than two observed values.

The RPD for duplicate or split samples is calculated as shown in Equation (2) below:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} (100\%) \quad (2)$$

where

RPD = relative percent difference

$C_1$  = larger of the two observed values

$C_2$  = smaller of the two observed values.

If the two sample concentrations are less than the MDL, then the RPD is not calculated. If one sample concentration is less than the detection limit, then one half of the MDL limit can be used in the RPD calculation. A note referring to the method used for the calculation of a reported RPD for duplicate sample results will be provided with all precision calculations.

The RSD for three or more observed values is calculated as shown in Equation (3) below:

$$\%RSD = \left( \frac{s}{\bar{x}} \right) 100 \quad (3)$$

where

RSD = relative standard deviation

$s$  = standard deviation

$\bar{x}$  = mean of observations.

The standard deviation is calculated as shown in Equation (4) below:

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}} \quad (4)$$

where

$s$  = standard deviation

$x_i$  = measured value of the observation

$\bar{x}$  = mean of observation measurements

n = number of observations.

For measurements (such as pH) where absolute variation is more appropriate, the PAR of duplicate measurement calculation can be used in lieu of the standard deviation.

The PAR is calculated as shown in Equation (5) below:

$$D = |m_1 - m_2| \quad (5)$$

where

D = absolute range

m<sub>1</sub> = first measurement

m<sub>2</sub> = second measurement.

Precision of radionuclide measurements is determined using the mean difference calculation shown in Equation (6) below:

$$MD_p = \frac{|S - D|}{\sqrt{(\sigma_s^2 + \sigma_D^2)}} \quad (6)$$

where

MD<sub>p</sub> = the statistical difference of the duplicate results

S = the sample result (as pCi/g or pCi/L)

D = the duplicate sample result (as pCi/g or pCi/L)

σ<sub>D</sub> = the associated total propagated 1σ uncertainty of the duplicate result (as a standard deviation)

σ<sub>s</sub> = the associated total propagated 1σ uncertainty of the sample result (as a standard deviation).

**4.3.2.2 Accuracy.** Two calculations will be used to assess laboratory accuracy: (1) percent recovery of the MS and (2) percent recovery of known and/or blind LCS.

The percent recovery of the MS is calculated as shown in Equation (7) below:

$$\%R = \frac{C_i - C_0}{C_t} \times 100\% \quad (7)$$

where

- %R = percent recovery
- $C_i$  = measured concentration of spiked aliquot
- $C_0$  = measured concentration of unspiked aliquot
- $C_t$  = concentration of spike added, expressed as a weight to volume ratio (i.e., weight of applicable analyte spiked into sample aliquot per final volume of spiked sample aliquot).

The percent recovery of a known and/or blind LCS or a standard reference material is calculated as shown in Equation (8) below:

$$\%R = \frac{C_m}{C_a} (100\%) \quad (8)$$

where

- %R = percent recovery
- $C_m$  = measured concentration of the standard reference material or the LCS
- $C_a$  = actual or certified amount of analyte in the sample.

For determining accuracy of radionuclide measurements compared to a known value, the mean difference calculation is used as shown in Equation (9) below:

$$MD_a = \frac{|S - K|}{\sqrt{\left(\sigma_s^2 + \sigma_k^2\right)}} \quad (9)$$

where

- $MD_a$  = the statistical difference of the PE sample result and the known value
- $S$  = the PE sample result (as pCi/g or pCi/L)
- $K$  = the certified activity (as pCi/g or pCi/L) for the known sample (LCS or PE sample)

- $\sigma_k$  = the associated total propagated  $1\sigma$  uncertainty of the known (as a standard deviation)
- $\sigma_s$  = the associated total propagated  $1\sigma$  uncertainty of the sample result (as a standard deviation).

**4.3.2.3 Completeness.** One calculation will be used to assess completeness. Completeness is calculated as shown in Equation (10) below:

$$\%C = \frac{S_a}{S_t} \times 100\% \quad (10)$$

where

- $\%C$  = percent completeness
- $S_a$  = number of samples for which acceptable data are generated
- $S_t$  = the total number of samples planned in the FSP.

## 5. REFERENCES

- 40 CFR 136, 2003, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," *Code of Federal Regulations*, Office of the Federal Register, September 2003.
- 40 CFR 136.3, 2003, "Identification of Test Procedures," *Code of Federal Regulations*, Office of the Federal Register, September 2003.
- 40 CFR 300, 2004, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, February 2004.
- 49 CFR 172, 2004, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements," *Code of Federal Regulations*, Office of the Federal Register, January 2004.
- 54 FR 48184, 1989, "National Priorities List of Uncontrolled Hazardous Waste Sites; Final Rule," *Federal Register*, U.S. Environmental Protection Agency, November 21, 1989.
- 42 USC § 300f to 300j-26, 1974, "Safe Drinking Water Act," *United States Code*.
- 42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act (Solid Waste Disposal Act)," *United States Code*, October 21, 1976.
- 42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*, December 11, 1980.
- ASTM C127-88, 2001, "Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate," American Society for Testing and Materials, August 10, 2001.
- ASTM C493-98, 1998, "Standard Test Method for Bulk Density and Porosity of Granular Refractory Materials by Mercury Displacement," American Society for Testing and Materials, March 10, 1998. (This standard was withdrawn in 2002.)
- ASTM C496-96, 1996, "Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens," American Society for Testing and Materials, January 1, 1996.
- ASTM C1069-86(1997)e1, 1997, "Standard Test Method for Specific Surface Area of Alumina or Quartz by Nitrogen Absorption," American Society for Testing and Materials, January 1, 1997.
- ASTM D422-63, 2002, "Standard Test Method for Particle-Size Analysis of Soils," American Society for Testing and Materials, November 10, 2002.
- ASTM D445-03, 2003, "Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)," American Society for Testing and Materials, March 10, 2003.
- ASTM D698-00a, 2000, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> [600 kN-m/m<sup>3</sup>])," American Society for Testing and Materials, June 10, 2000.

- ASTM D854-02, 2002, “Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer,” American Society for Testing and Materials, July 10, 2002.
- ASTM D934-80, 1999, “Standard Practices for Identification of Crystalline Compounds in Water-Formed Deposits by X-Ray Diffraction,” American Society for Testing and Materials, June 10, 1999.
- ASTM D1556-00, 2000, “Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method,” American Society for Testing and Materials, March 10, 2000.
- ASTM D1557-02, 2002, “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> [2,700 kN-m/m<sup>3</sup>]),” American Society for Testing and Materials, November 10, 2002.
- ASTM D2166-00, 2000, “Standard Test Method for Unconfined Compressive Strength of Cohesive Soil,” American Society for Testing and Materials, June 10, 2000.
- ASTM D2216-98, 1998, “Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,” American Society for Testing and Materials, February 10, 1998.
- ASTM D2325-68, 2000, “Standard Test Method for Capillary-Moisture Relationships for Coarse- and Medium-Textured Soils by Porous-Plate Apparatus,” American Society for Testing and Materials, January 1, 2000.
- ASTM D2434-68, 2000, “Standard Test Method for Permeability of Granular Soils (Constant Head),” American Society for Testing and Materials, January 1, 2000.
- ASTM D2435-03, 2003, “Standard Test Method for One-Dimensional Consolidation Properties of Soils,” American Society for Testing and Materials, June 10, 2003.
- ASTM D2850-03, 2003, “Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils,” American Society for Testing and Materials, February 10, 2003.
- ASTM D2922-01, 2001, “Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth),” American Society for Testing and Materials, June 10, 2001.
- ASTM D2983-02b, 2003, “Standard Test Method for Low-Temperature Viscosity of Lubricants Measured by Brookfield Viscometer,” American Society for Testing and Materials, January 1, 2002.
- ASTM D3017-01, 2001, “Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth),” American Society for Testing and Materials, June 10, 2001.
- ASTM D3152-72, 2000, “Standard Test Method for Capillary-Moisture Relationships for Fine-Textured Soils by Pressure-Membrane Apparatus,” American Society for Testing and Materials, January 1, 2000.
- ASTM D4318-00, 2000, “Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,” American Society for Testing and Materials, June 10, 2000.

- ASTM D4319-93(2001), 1993, "Standard Test Method for Distribution Ratios by the Short-Term Batch Method," American Society for Testing and Materials, January 1, 1993.
- ASTM D4525-90, 1990, "Standard Test Method for Permeability of Rocks by Flowing Air," American Society for Testing and Materials, May 25, 1990.
- ASTM D4611-86, 2000, "Standard Test Method for Specific Heat of Rock and Soil," American Society for Testing and Materials, January 1, 2000.
- ASTM D4972-01, 2001, "Standard Test Method for pH of Soils," American Society for Testing and Materials, January 10, 2001.
- ASTM D5057-90(2001), 1996, "Standard Test Method for Screening Apparent Specific Gravity and Bulk Density of Waste," American Society for Testing and Materials, October 10, 1996.
- ASTM D5058-90(2001), 2001, "Standard Test Methods for Compatibility of Screening Analysis of Water," American Society for Testing and Materials, January 1, 2001.
- ASTM D5084-00E1, 2000, "Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter," American Society for Testing and Materials, September 10, 2000.
- ASTM D5084-90, 1990, "Standard Test Method for Measurement of Hydraulic Conductivity of Saturated and Porous Material Using a Flexible Wall Permeameter," American Society for Testing and Materials, June 29, 1990.
- ASTM D5334-00, 2000, "Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure," American Society for Testing and Materials, June 10, 2000.
- ASTM D5856-95(2002)e1, 1995, "Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter," American Society for Testing and Materials, November 10, 1995.
- ASTM D854-02, 2002, "Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer," American Society for Testing and Materials, July 10, 2002.
- ASTM E1147-92(1997), 1997, "Standard Test Method for Partition Coefficient (N-Octanol/Water) Estimation by Liquid Chromatography," American Society for Testing and Materials, January 1, 1997.
- Becker, B. H., T. A. Bensen, C. S. Blackmore, D. E. Burns, B. N. Burton, N. L. Hampton, R. M. Hampton, R. M. Huntley, R. W. Jones, D. Jorgensen, S. O. Magnuson, C. Shapiro, and R. L. VanHorn, 1996, *Work Plan for Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, INEL-95/0343, Revision 0, Idaho National Engineering and Environmental Laboratory, May 1996.
- Dames & Moore, 1995, *Remedial Investigation/Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory—Volume II: Feasibility Study*, INEL-94/0124 (formerly EGG-ER-11219), Revision 0, Idaho National Engineering and Environmental Laboratory, February 1995.



- DOE-ID, 1987, *Consent Order and Compliance Agreement*, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and the U.S. Geological Survey, July 10, 1987.
- DOE-ID, 1991a, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Docket No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 4, 1991.
- DOE-ID, 1991b, *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Docket No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 1991.
- DOE-ID, 1994a, *Record of Decision Declaration for Pad A at the Radioactive Waste Management Complex Subsurface Disposal Area*, Document Id. 5632, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, January 1994.
- DOE-ID, 1994b, *Record of Decision Declaration for Organic Contamination in the Vadose Zone, Operable Unit 7-08*, Document Id. 5761, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, November 1994.
- DOE-ID, 1997a, *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10557, Revision 0, U.S. Department of Energy Idaho Operations Office, November 1997.
- DOE-ID, 1997b, *Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10531, Revision 0, U.S. Department of Energy Idaho Operations Office, February 1997.
- DOE-ID, 1997c, *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part A, RI/BRA Report (Final)*, DOE/ID-10534, Revision 0, U.S. Department of Energy Idaho Operations Office, November 1997.
- DOE-ID, 1997d, *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part B, FS Report (Final)*, DOE/ID-10572, Revision 0, U.S. Department of Energy Idaho Operations Office, November 1997.
- DOE-ID, 1998, *Addendum to the Work Plan for the Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10622, Revision 0, U.S. Department of Energy Idaho Operations Office, August 1998.
- DOE-ID, 1999a, *Final Record of Decision for Test Area North, Operable Unit 1-10*, DOE/ID-10682, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, October 1999.

- DOE-ID, 1999b, *Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13*, DOE/ID-10660, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, October 1999.
- DOE-ID, 1999c, *Waste Area Group 5 Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10607, Revision 0, U.S. Department of Energy Idaho Operations Office, January 1999.
- DOE-ID, 1999d, *Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10554, Revision 0, U.S. Department of Energy Idaho Operations Office, April 1999.
- DOE-ID, 1999e, *Work Plan for Stage I of the Operable Unit 7-10 Staged Interim Action*, DOE/ID-10623, Revision 1, U.S. Department of Energy Idaho Operations Office, September 1999.
- DOE-ID, 2000, *Comprehensive Remedial Investigation/Feasibility Study for the Central Facilities Area Operable Unit 4-13 at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10680, Revision 1, U.S. Department of Energy Idaho Operations Office, July 2000.
- DOE-ID, 2001, *Record of Decision Amendment Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action*, DOE/ID-10139 Amendment, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, September 2001.
- EPA, 1983, *Methods for Chemical Analysis of Water and Wastes*, EPA/600/4-79/020, U.S. Environmental Protection Agency.
- EPA, 1986, *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods*, SW-846, Third Edition, U.S. Environmental Protection Agency.
- EPA, 1987a, *Data Quality Objectives for Remedial Response Activities: Development Process and Case Studies*, EPA/540/G-87/003, U.S. Environmental Protection Agency, August 1987.
- EPA, 1987b, *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, U.S. Environmental Protection Agency, December 1987.
- EPA, 1988, *Methods for Determination of Organic Compounds in Drinking Water*, EPA/600/4-88/039, U.S. Environmental Protection Agency, December 1988.
- EPA, 1989a, *Preparing Perfect Project Plans*, EPA/600/9-89/087, U.S. Environmental Protection Agency, October 1989.
- EPA, 1989b, *Soil Sampling Quality Assurance User's Guide*, EPA/600/8-89/046, U.S. Environmental Protection Agency, March 1989.
- EPA, 1989c, *Methods for Evaluating the Attainment of Cleanup Standards—Volume 1: Soils and Solid Media*, EPA/230/2-89/042, U.S. Environmental Protection Agency, February 1989.

- EPA, 1990, *Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures*, EPA/540/G-90/004, OSWER Directive 9360.4-01, U.S. Environmental Protection Agency, April 1990.
- EPA, 1991a, *Preparation Aids for the Development of Category III Quality Assurance Project Plans*, EPA/600/8-91/005, U.S. Environmental Protection Agency, February 1991.
- EPA, 1991b, *Soil Sampling and Analysis for Volatile Organic Compounds*, EPA/540/4-91/1001, U.S. Environmental Protection Agency, February 1991.
- EPA, 1991c, *Characterizing Soils for Hazardous Waste Site Assessments*, EPA/540/4-91/1001, U.S. Environmental Protection Agency, March 1991.
- EPA, 1991d, *Methods for Determination of Organic Compounds in Drinking Water*, EPA/600/4-88/039, U.S. Environmental Protection Agency, July 1991.
- EPA, 1992, *Performing Site Inspections Under CERCLA*, EPA540-R-92-021, U.S. Environmental Protection Agency, September 1992.
- EPA, 1993a, *Data Quality Objectives Process for Superfund, Interim Final Guidance*, EPA/540-R-93-071, U.S. Environmental Protection Agency, September 1993.
- EPA, 1993b, *Statement of Work for Inorganic Analysis-Multi-Media, Multi-Concentration*, ILM03.0, U.S. Environmental Protection Agency, Contract Laboratory Program, June 1993.
- EPA, 1994, *Guidance for the Data Quality Objective Process*, EPA QA/G-4, U.S. Environmental Protection Agency, September 1994.
- EPA, 1998a, *EPA Guidance for Quality Assurance Project Plans*, EPA QA/G-5, U.S. Environmental Protection Agency, February 1998.
- EPA, 1998b, *Guidance for the Data Quality Assessment*, EPA/600/R-96/084, U.S. Environmental Protection Agency.
- EPA, 1999, *Statement of Work for Organic Analysis-Multi-Media, Multi-Concentration*, OLM04.2, U.S. Environmental Protection Agency, Contract Laboratory Program, July 1999.
- EPA, 2001, *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, U.S. Environmental Protection Agency, March 2001.
- EPA, 2002, *Guidance on Choosing a Sampling Design of Environmental Data Collection*, EPA QA/G-5S, U.S. Environmental Protection Agency, December 2002.
- ER-SOW-394, 2002, "Idaho National Engineering and Environmental Laboratory Sample and Analysis Management Statement of Work for Analytical Services," Revision 1, Idaho National Engineering and Environmental Laboratory, December 2002.
- Form 412.11, 2002, "Document Management Control System (DMCS) Document Action Request (DAR)," Revision 9, Idaho National Engineering and Environmental Laboratory, September 2002.
- GDE-201, 2003, "Inorganic Analyses Data Validation for INEEL Sample and Analysis Management," Revision 0, Idaho National Engineering and Environmental Laboratory, September 2003.

- GDE-7003, 2002, “Levels of Analytical Method Data Validation,” Revision 1, Idaho National Engineering and Environmental Laboratory, December 2002.
- Harris, G. A., 1990, “Guidance for Determining Field Precision and Number of Samples,” *Development and Support Material for Writing Sampling and Analysis Reports*, Revision 2, Environmental Restoration Program Data Integrity Review Committee, January 1990.
- INEEL, 1997, *Explanation of Significant Differences from the Record of Decision for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action, Operable Unit 1-07B, Waste Area Group 1*, INEEL/EXT-97-00931, Revision 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency; and Idaho Department of Health and Welfare, Division of Environmental Quality, November 1997.
- INEL, 1995, *Data Management Plan for the Idaho National Engineering Laboratory Environmental Restoration Program*, INEL-95/0257 (formerly EGG-ERD-10227), Revision 1, Idaho National Engineering and Environmental Laboratory, June 1995.
- Kaminsky, J. F., K. N. Keck, A. L. Schafer-Perini, C. F. Hersley, R. P. Smith, G. J. Stormberg, and A. H. Wylie, 1994, *Remedial Investigation Final Report with Addenda for the Test Area North Groundwater Operable Unit 1-07B at the Idaho National Engineering Laboratory*, EGG-ER-10643, Revision 0, Idaho National Engineering and Environmental Laboratory, January 1994.
- Keck, K. N., I. Porro, A. J. Sondrup, S. H. McCormick, and S. M. Lewis, 1995, *Remedial Investigation/Feasibility Study for Operable Unit 4-12: Central Facilities Area Landfills I, II, and III at the Idaho National Engineering Laboratory—Volume I: Remedial Investigation*, INEL-94/0124 (formerly EGG-ER-11219), Revision 0, Idaho National Engineering and Environmental Laboratory, February 1995.
- Klute, A. (ed.), 1986, *Methods of Soil Analysis*, American Society of Agronomy, Inc., and Soil Science Society of America, Inc.
- Lewis, S. M., P. O. Sinton, M. J. Condran, and J. W. Gordan, 1992, *Remedial Investigation Report for the Test Reactor Area Perched Water System (Operable Unit 2-12)*, EGG-EM-10002, Revision 0, Idaho National Engineering and Environmental Laboratory, June 1992.
- LST-9, 2004, “INEEL Records Schedule Matrix,” Revision 9, *Manual 1—General Administration and Information*, Idaho National Engineering and Environmental Laboratory, February 2004.
- MCP-1192, 2003, “Chain of Custody and Sample Labeling for ER and D&D&D Projects,” Revision 0, *Environmental Restoration Work Processes Manual*, Idaho National Engineering and Environmental Laboratory, March 2004.
- MCP-3480, 2004, “Environmental Instructions for Facilities, Processes, Materials, and Equipment,” Revision 8, *Manual 8—Environmental Protection and Compliance*, Idaho National Engineering and Environmental Laboratory, November 2002.
- NCSL Z540-1-1994, 2001, “Calibration Laboratories and Measuring Test Equipment—General Requirements,” National Conference of Standards Laboratories, July 2001.

- Page, A. L., 1982, "Methods of Soil Analysis," Part 2, 2<sup>nd</sup> edition, Agronomy Monographs 9, ASA and SSSA, Madison, Wisconsin.
- Parsons Corporation, 1995, *Remedial Action Report Pad A Limited Action, Operable Unit 7-12*, INEL-95/0313, Revision 2, Idaho National Engineering and Environmental Laboratory, Parsons Corporation, July 1995.
- PLN-476, 2002, "Documents and Records Management Plan for the Balance of INEEL Cleanup Project," Revision 2, Idaho Completion Project, January 2004.
- PLN-694, 2004, "Project Execution Plan for the Balance of INEEL Cleanup Project," Revision 4, Idaho Completion Project, January 2004.
- PLN-862, 2002, "Performance Evaluation Sample Program Plan," Revision 1, Idaho National Engineering and Environmental Laboratory, July 2002.
- PLN-883, 2001, "Records Management Plan—Electronic Document Management System (EDMS)," Revision 0, Idaho National Engineering and Environmental Laboratory, May 2001.
- Sciencetech, 1995, *Final Remedial Design/Remedial Action Workplan, Organic Contamination in the Vadose Zone, Operable Unit 7-08, Radioactive Waste Management Complex Subsurface Disposal Area*, Document Id. SCIE-COM-200-95, Revision 0, prepared for the Idaho National Engineering and Environmental Laboratory, October 1995.
- TPR-80, 1997, "Radioanalytical Data Validation," Revision 2, Idaho National Engineering and Environmental Laboratory, May 1997.
- TPR-81, 2001, "Validation of Volatile Organic Compounds Data Analyzed Using Gas Chromatography/Mass Spectrometry," Revision 0, Idaho National Engineering and Environmental Laboratory, October 2001.
- TPR-82, 2001, "Validation of Gas and Liquid Chromatographic Organic Data," Revision 0, Idaho National Engineering and Environmental Laboratory, October 2001.
- TPR-174, 2001, "Validation of Semi-Volatile Organic Compounds Data Analyzed Using Gas Chromatography/Mass Spectrometry," Revision 0, Idaho National Engineering and Environmental Laboratory, October 2001.
- VanGenuchten, M., 1980, "A Closed-Form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils," *Soil Science Society of America Journal*, 44, pp. 892–898.
- Zimmerle, J. R., 1992, *Remedial Investigation/Feasibility Study Work Plan and Addenda for Test Area North Groundwater Operable Unit at the Idaho National Engineering Laboratory*, EGG-WM-9905, Revision 0, Idaho National Engineering and Environmental Laboratory, May 1992.

**Appendix A**

**Additional Field Sampling Plan Requirements**



## **Appendix A**

### **Additional Field Sampling Plan Requirements**

In accordance with this Quality Assurance Project Plan (QAPjP), the following additional items must be included in a field sampling plan:

- Title page
- Table of contents
- Site background
- Sampling objectives
- Sample location and frequency
- Presampling meeting
- Sample designation
- Sampling equipment and procedures
- Sample handling and analysis
- Waste management
- Site map
- Specification of data categories
- Target validation levels
- Target analytical levels
- Critical samples
- Specific procedure for any nonstandard methods (a copy of the procedure should be attached to the field sampling plan)
- Accuracy, precision, and detection limit data (as applicable) for any method used and not included in the QAPjP
- Organization chart
- Detection limits for methods presented in this QAPjP when method deviations will result in detection limits different from those listed
- Quality assurance objectives, if different from those in QAPjP



- Analytical error determinations for screening data collected from field measurements
- Waste minimization/waste management plans for sampling waste streams
- Decontamination procedures
- Specific sampling procedures
- Additions to or deviations from the sample container size, sample mass, and preservatives listed in the tables in the QAPjP
- Specific alternative chain-of-custody procedure(s) if Management Control Procedure (MCP) -1192, "Chain of Custody and Sample Labeling for ER and D&D&D Projects," will not be used
- Preshipment sample screening procedures
- Justification for use of screening data without 10% definitive data used as confirmation (when applicable)
- Inspection/acceptance requirements for supplies and consumables not provided in Section 2.8 of this QAPjP
- Data management functions not specified in Section 2.10 of this QAPjP
- Proposed method of data quality assessment.

## **Appendix B**

### **Examples of Forms Used**



# Appendix B

## Examples of Forms Used

WAG 5 REMEDIAL ACTION - PHASE 1

SAMPLE ID: 5RA203013A

DATE (ddmmmyyyy)

LOCATION: CONTAINER #2 - VAULT

ANALYSIS: Analysis Suite #1

TIME:

SAMPLER:

DEPTH: NA

---

PRESERVATIVE: 4°C



5RA203013A

WAG 5 REMEDIAL ACTION - PHASE 1

SAMPLE ID: 5RA203013A

DATE (ddmmmyyyy)

LOCATION: CONTAINER #2 - VAULT

ANALYSIS: Analysis Suite #1

TIME:

SAMPLER:

DEPTH: NA

---

PRESERVATIVE: 4°C



5RA203013A

WAG 5 REMEDIAL ACTION - PHASE 1

SAMPLE ID: 5RA202023A

DATE (ddmmmyyyy)

LOCATION: CONTAINER #1 - VAULT

ANALYSIS: Analysis Suite #1

TIME:

SAMPLER:

DEPTH: NA

---

PRESERVATIVE: 4°C



5RA202023A

WAG 5 REMEDIAL ACTION - PHASE 1

SAMPLE ID: 5RA202023A

DATE (ddmmmyyyy)

LOCATION: CONTAINER #1 - VAULT

ANALYSIS: Analysis Suite #1

TIME:

SAMPLER:

DEPTH: NA

---

PRESERVATIVE: 4°C



5RA202023A

WAG 5 REMEDIAL ACTION - PHASE 1

SAMPLE ID: 5RA202013A

DATE (ddmmmyyyy)

LOCATION: CONTAINER #1 - VAULT

ANALYSIS: Analysis Suite #1

TIME:

SAMPLER:

DEPTH: NA

---

PRESERVATIVE: 4°C



5RA202013A

435.20  
9/11/2002  
Rev. 02

# INEEL CHAIN OF CUSTODY FORM

21311

See Instructions On Back

Page \_\_\_\_\_ of \_\_\_\_\_

<sup>1</sup> Sampler (Printed):		<sup>2</sup> Sampler (Signature):		<sup>3</sup> Project Name:				
				<sup>5</sup> Sampling & Analysis Plan Number:			<sup>6</sup> TOS/SOW/PSR Number:	
<sup>4</sup> Laboratory Shipped To:								
<sup>7</sup> Sample ID#	<sup>8</sup> Sample Date	<sup>9</sup> Sample Time	<sup>10</sup> Sample Location	<sup>11</sup> Depth	<sup>12</sup> Sample Matrix	<sup>13</sup> Analysis Type No(s)	<sup>14</sup> Preservative	<sup>15</sup> Remarks
<sup>16</sup> Comments:								
Cooler Number(s):								
<sup>17</sup> Relinquished By (Printed)	<sup>18</sup> Relinquished By (Signature)	<sup>19</sup> Date	<sup>20</sup> Time	<sup>21</sup> Received By (Printed)	<sup>22</sup> Received By (Signature)	<sup>23</sup> Date	<sup>24</sup> Time	

Distribution: Original & Yellow: Accompany Shipment To Laboratory

Pink: Forward To Sample Management

Green: Retained By Project

## INEEL CHAIN OF CUSTODY FORM

### INSTRUCTIONS

1. Print full name of Sampler.
2. Signature of Sampler.
3. Print project name.  
This shall be the same project name that is used in the appropriate Task Order Statement of Work (TOS) or Statement of Work (SOW) that has been entered into Box 6 of this form.
4. Print the name of the laboratory where sample(s) will be shipped.
5. Print the Sampling & Analysis Plan Document Number.  
(An abbreviated Sampling & Analysis Plan Document, Characterization Plan Document, Field Sampling Plan Document, or Test Plan Document number may be used.)
6. Print complete TOS or SOW number. If a PSR form is being used, enter complete PSR number. This field must be completed or use "N/A" if appropriate. Include Revision Number or applicable revision suffix code (e.g., ER-TOS-XXXXR1).
7. Print sample identification numbers legibly.  
NOTE: Ensure that the information on each sample container match the Chain-Of-Custody Form 435.20 sample identification numbers exactly. (Sample identification numbers shall match the sample label exactly.)
8. – 11. Enter sampling date, time, location, and depth for each sample. Enter "N/A" if appropriate.  
(Enter the sample location that appears on the label/SAP table, if one has been produced.)
12. Print sample matrix description. For any given sample, identify the matrix as either:
  - a. it is specifically and unambiguously defined in the associated TOS/SOW (the terminology used to identify the matrix of each sample on this COC form shall exactly match the terminology used in Table 1 of the applicable TOS/SOW), or
  - b. when not specifically and unambiguously defined in the associated TOS/SOW (e.g., matrices generically identified as either unspecified liquids or unspecified solids in Table 1 of the TOS/SOW), the sampler shall identify its matrix on this COC as clearly and unambiguously as possible.
13. Print Analysis Type Number(s).  
Analysis Type Number(s) can be found in Table 1 of the appropriate TOS or SOW.
14. List preservative for each sample, if used. Enter "N/A" if appropriate.
15. Print appropriate Remarks.  
Examples of appropriate Remarks are:  
QC Rinse  
Bottle Not Filled Complete
16. Print appropriate Comments.  
Examples of appropriate Comments are:  
Field Team Leader Name  
No More Samples Will Be Shipped Under (state TOS or SOW number)  
NOTE: Comments that change the scope of the associated TOS or SOW are inappropriate.
17. Print the name of the Sampler relinquishing the sample(s).  
NOTE: Ensure that the name of the Sampler relinquishing the sample is the same as the name listed in Box 1.
18. Signature of Sampler relinquishing the sample(s).
19. – 20. Date and Time sample(s) were relinquished by the sampler.
21. – 22. Printed name and signature of personnel receiving the sample(s).
23. – 24. Date and Time sample(s) were received.

NOTE: Your signature on this form documents your review of all information on this COC.

- Ensure errors are corrected by drawing a single line through the incorrect information and entering the correct information
- Ensure all corrections are initialed and dated.
- Ensure That:
  - Offsite Lab – The date and time that the COC is taped into the top of the cooler is recorded.
  - Onsite Lab – The laboratory sample custodian records that the samples were received at the exact date and time as recorded by the relinquishing sampler.